# PERSONAL COMPUTING

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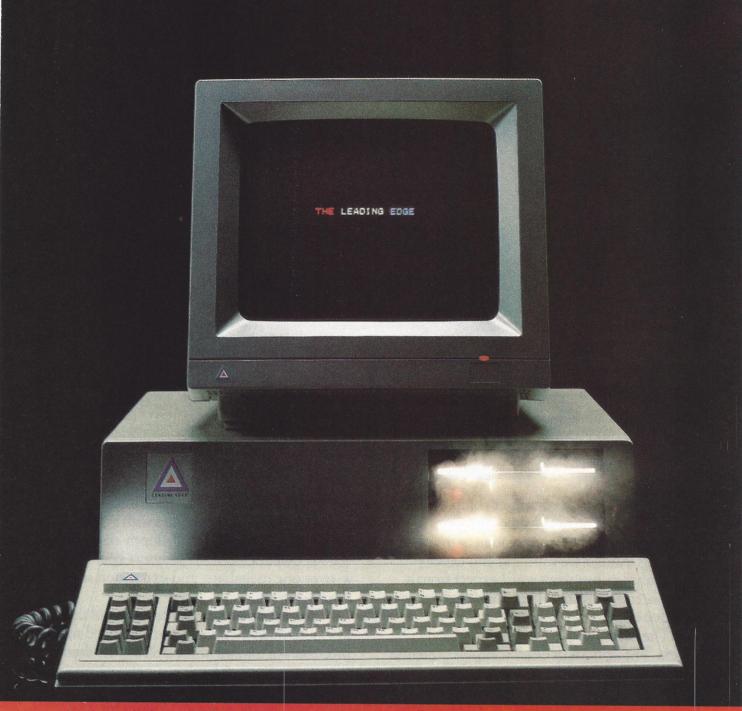
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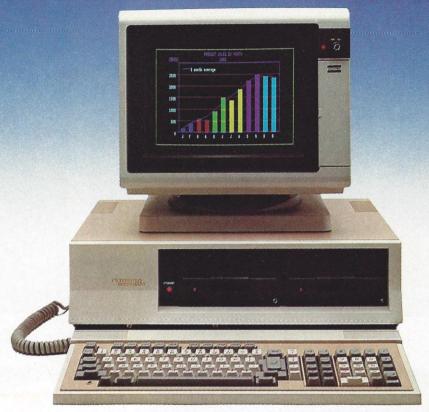
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CIRCLE 20

# Taking Your Next Computing Step

**In The Race** **Making Your Point**
**Wall Street Connection** **Saving Energy**

## The Computer Finds A Home In The Pits

**E**nglishman Ian Reed sits comfortably at his drawing table in the offices of Domino's Pizza Team Shierson in Adrian, Mich., surrounded by the memorabilia of a successful car-racing season. Amidst the litter of T-squares, compass, and french curves, lurks a novel addition to a racing engineer's arsenal—a series of computer printouts detailing simulations of race laps on an unbuilt track, and printouts of racing phenomena thought unobtainable.

It seems strange that while so many recent automobile advertisements trumpet silicon-based advances in technology, racing, which many perceive as the forward edge of development, has remained barren of the chip. Nowhere in this wealth of increasingly arcane technology has there been a method for gathering quantitative, reliable, repeatable data. Instead, racing has relied on the interaction between car and driver— the "feel" of each minute change as relayed by each driver to his crew chief. This body of experience, talk, hand gestures, and guesses constitutes the data base of modern racing . . . until Ian Reed, Kurt Borman, and Motion Technology set out to bring the future to racing.

Shierson Racing is a relative newcomer to the racing circuit. To catch up with the more experienced teams, to duplicate their experience, takes

either a corresponding number of years, or a better method of gathering and analyzing the forces that act on the race car. If these forces could be quantified, identified, and interpreted, the Shierson team could quickly have a very good setup—a platform which would allow the team more time to fine tune each area . . . time to experiment . . . time to learn.
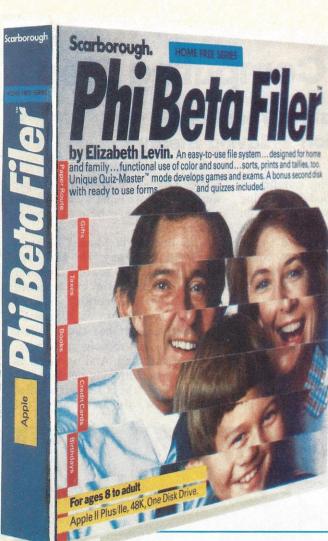
"Our biggest problem had always been testing—getting quantitative information," says Reed. "It was always subjective and very qualitative. The drivers would come in and say, 'it feels a bit better,' or 'it feels a bit

worse.' Often, you would get the car working very well and then, to make any progress, you'd have to spend a fortune testing."

Kurt Borman of Motion Technology knew of a way. He had been working with on-board computer systems to collect the much-needed quantitative test results. "Kurt's system," says Reed, "is completely self-contained. It has the absolute minimum of connections and a maximum of shielding. And we put it as far away from anything electric as we could." Thus, "the box," as it is called by the crew, sits in front of the



Team driver Howdy Holmes waits patiently in the pits as the data he has collected is downloaded from his car's on-board computer.

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# The Scarborough System.

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As Howdy Holmes speeds around the track, the computer collects data vital to his car's performance in the race.

Photo by Thom Connell

driver's feet, caged in the forward-most part of the car.

The box, a product of Motion Technology, is a custom EPROM device—much more the firm won't say. At this stage, the box has 8k of RAM memory (although there are chips to extend memory to 32k). All the gathered data are stored in RAM, then downloaded to digital tape as soon as the car enters the pits.

Data analysis, comparison, and computing is done on an aging Apple II Plus, which is used so much "the keyboard is all loose and rattley." Reed has added two Apple disk drives and a Saturn 32k RAM board for quicker and easier intermediate calculations. An Apple communication interface is resident, although modified to 4800 baud to access the tape data from the box.

The heart of the system, the software, is all custom written. On board the race car, sophisticated Motion Technology hardware stores the data. The Apple software was written by Reed (who did his Master's thesis on a computer simulation of an internal combustion engine).

"One of our considerations was *not*

to heavily modify the system," says Reed. "In case it pitches, I can go to a store and buy or rent a card, or borrow another Apple or a Franklin."

But the system has worked pretty well. As a matter of fact, the computers paid for themselves at Indianapolis in 1982. All of the teams, not just Shierson, were experiencing a series of devastating and expensive gearbox failures. Conventional wisdom held that there was simply a lack of lubrication, brought on by the extreme g-forces in the corners, forcing oil away from the gears and the lubrication pump pickup. Naturally, every mechanic had his own magic cure—none of which seemed to work. At that point Reed said, "Look, gearboxes are exploding left, right, and center—after doing two races with no problems! We're being silly. We've got this box on the car, let's use it!"
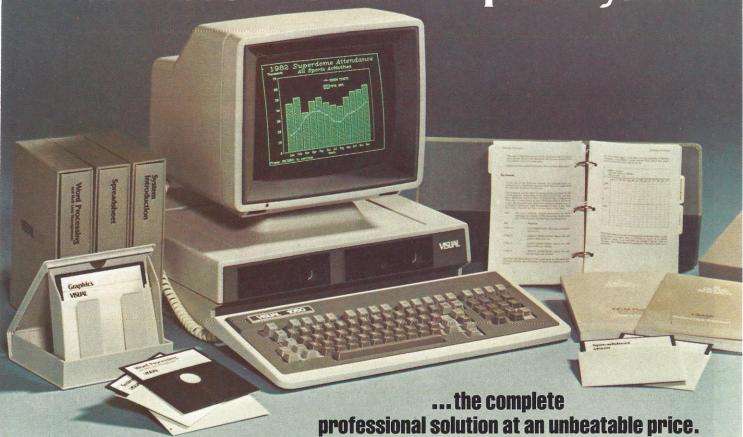
The box was installed in the gearbox oil system pressure line. It quickly became obvious that, in the last 200 yards of the mile-long Indy straightaways, oil pressure dropped to zero. Then, in each turn, the pressure would flick back up again. This was completely contrary to all the

pundits' theories. Simply stated, the long straights allowed the lubrication system to pump itself dry. Moving the pump pickup $2\frac{1}{2}''$ cured the problem for Shierson. "We were then running with no problems, while the others were still pitching," says Reed. "It finally dawned on the others that we weren't having any problems—so we relented and shared information."

The most spectacular use of the system came in 1983—and again at the Indianapolis 500. At Indy, qualifying is more important and more difficult than at any other track. Each mile per hour, each tenth, each hundredth, is fought for. To make any change that results in a whole one-mile-per-hour increase is a major achievement.

Early on, Howdy Holmes (the driver) was running at 188 mph and complaining of understeer. Fortunately, while he was at an autograph session the team had time to evaluate their data. Downloading the data into the Apple, once again installed in the transporter, Reed could see that the front of the car was too high and the rear too low. "So we lifted the rear a quarter of an inch and dropped the

front one-eighth. We did nothing else, and we picked up 10 miles per hour. We did 198 immediately."

In other areas of measurement and testing, the Shierson team has checked shock absorbers and found they could predict their failure. They've measured temperatures and pressures on the bodywork. Yet this only scratches the surface, for the setup sheet for each race lists more than 30 interactive factors.

"One thing we've noticed is that we can't just set up the car to suit the computer. What if the driver says it's harsh as hell and bloody undriveable?" Reed comments. There has to be a compromise between the two brains.

"At Indy, our best lap was 201 mph. We got there very quickly by using the computer and instruments to extract the most out of the chassis at that point," says Reed. With the additional time, the team could concentrate on creating "a superb race chassis. Howdy was able to drive anywhere on the track—he even overtook on the grass in Turn 3!

"Using the instruments to knock the rough edges out of our setup helps us to get the best out of what we've got," says Reed. "It points us in the direction of what it will take to go faster."

Where the system really works is in developing the car. You can actually see drivers' styles and compare them. Shierson has had Johnny Rutherford drive the car, as well as team driver Holmes. While their lap times are similar, their styles, as profiled on the monitor, are quite distinctly different. "It's a bit like a fingerprint for each driver," says Reed.

One potential area of discord, however, is between driver and computer data. "Howdy Holmes has been very good about this," comments Reed. "I mean, there have been times when he has come in, described a problem, and the computer has contradicted him. Now a lot of drivers would throw major wobblies. Howdy has ac-

cepted it and together we've discovered why and where the discrepancies lie. He's worked very well with us."

With data-gathering well in hand, Reed has gone on to use those data in the unreal world of simulations. "We've approached our racing from a different angle. We put into our Apple the known physical factors of the race car—the weight, horsepower, spring rates, tires, aerodynamic configurations, and so forth. We can actually simulate the car going around the race track. By using the known results of a real car on a real track, we've been able to advance our simulations to the point where now we can plot the line the driver takes around the track. We can then ask the computer: How do we go faster?"

Reed's super-trick program runs for 72 hours. It takes all variables, changes and compares them, looking for the optimum setup. Using this program, Ian has calculated that in a perfect world—ideal tires, wind conditions, perfect braking points, coming out of each turn three inches from the wall—it should be possible for his car to lap Indy at 212 miles per hour. "What this simulation tells us is, that if we can duplicate these numbers from the unreal world on the real car, it is possible to go this fast. The beauty of the box is that, although we must make some guesses, ours are very good guesses."

Just how good are Reed's simulations? Prior to arrival at races in Cleveland and Las Vegas, the team obtained blueprints of the new tracks. Analyzing the drawings and feeding the resulting numbers to the Apple gave them excellent gear ratios. And the predicted lap times were very, very close. Even approximations of the setup could be predicted. "We turn up informed," he says. "Of course, there are changes when the real car meets the real track. Our pattern this year has been to be one of the fastest teams on the first day. We tend to get fairly close to our

ultimate setup fairly quickly."

All of the data are saved—from every session. "With 20/20 hindsight, we often find out new areas of development. Using the values we have in new ways constantly gives us new insights. Our next area of development will be aerodynamics."

In other areas, Shierson Racing uses the Apple for structural analysis, finite element analysis, VisiCalc work, tax preparation, and an occasional game of Pac-Man.
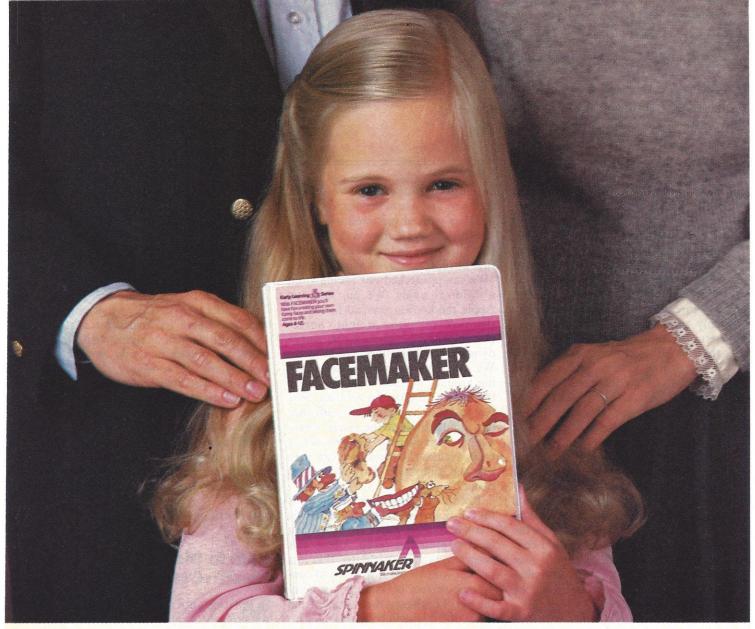
"There was always the possibility that it might not work out," Reed says. "There were any number of ways for Doug (Shierson, team owner) to have invested those dollars— ways which would have paid off much more quickly. But this choice has certainly paid off several times over."

—Thom Cannell

## Help In Slicing The Health-Care Pie

Making your point quickly and clearly is not always easy, especially when your point involves volumes of statistics and research, and concerns a complicated issue.

Consider the case of Drs. Susan and Roger Horn, professors and researchers at Johns Hopkins University in Baltimore. Their research into hospital reimbursement under the Medicare program's new predetermined fee system often involves 15 pounds or more of printout data— data which must be transformed into easily understood charts and graphs, since their audience often has little or no background in the field. But producing 30 or 40 graphs for slides and overheads for every presentation can be a long, tedious, expensive chore. The solution? Computer graphics, says Susan Horn, will not only produce them in a hurry but will make professional-quality "number pictures" that make a vivid and dramatic impression.

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CIRCLE 106

"Showing data in number form does not have as much impact as do visual charts," she explains, adding that computer graphics allow the Horns to "explain our research so that people with many different kinds of educational backgrounds can absorb the information"

Explaining research in a complicated field like health-care finances often means having to translate complex information into down-to-earth English. The Horns' research concerns Medicare's switch from the traditional "fee-for-service" hospital reimbursements to new set fees for "diagnosis-related" groups. One of the primary problems to date with the new system is its inability to take into account a factor called "severity of illness" when defining a standard fee for certain illnesses or diagnosis groups—a factor which frequently causes hospital charges to vary significantly within the same Medicare grouping.

"The reimbursement system needs to be more accurate, more equitable," says Susan, who is the associate director of the Center for Hospital Finance and Management as well as an associate professor at the University's School of Hygiene and Public Health.

"The government program (Medicare) calls for fixed reimbursement for each of 467 diagnosis-related groups," she says, "but some hospitals may be treating a large proportion of more severely ill patients. A hospital risks serious underpayment if its reimbursement is not adjusted for severity of illness."

To help get that point across to—among others—the Department of Health and Human Services, administrators of the Medicare program, the Horns turned to the persuasion power of high-quality graphics and the efficient production capabilities of a computer. They put their information into graphic form with the help of Chart-Master software from Decision Resources, used on an IBM

Personal Computer with a Hewlett-Packard plotter. Their slides cost only $1.50 each once the graphs have been plotted by the computer, a very significant savings over producing the graphs by hand, according to Roger, a professor in the University's GWC Whiting School of Engineering.

"Grants we work with would never allow the extravagance of 40 slides if it were expensive," he insists. "The money would have to go toward data collection. But this is like any other piece of enhanced technology. You



Drs. Roger and Susan Horn now have a clear view on the best way to present their medical research information—slides made with the help of a computer.

*Photo by Marty Katz*

not only save time with it, which leads to saving money, but you find you can do more things with it.

"If you have to sit and labor over some chart that you're drawing up, and if it's going to cost you an hour to do it, you're not going to make any changes in it once you get done," he says. "It's a whole different way of working and presenting data and analyses—you can do it not only much faster and much cheaper, but you can do it much better because you've got the flexibility to do it as

many times as you want to. You can preview what you want on the video screen first. If you don't like it, you change it; you change it 15 times if you like until you get it the way you want it."

Roger points out that working with the computer and the graphics software, even when it doesn't save time, saves aggravation and produces a superior product.

"It's a productivity device. We're able to do more in a day and do it better," he explains. "People sometimes get into computing thinking it's

going to save them time and money. Well, it often doesn't. But what they do get as a benefit is that they change the way that they do their work, and they produce a better product. You just do things you never would have attempted before and therefore that increases the quality of the work that you're doing, although maybe it doesn't, in the last analysis, really save you any time. If you only did what you were doing before, yes it would save you time. But you soon

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*dBase II,*® *Friday!,*™ *Microplan,*® *Graphplan,*™ *WordStar,*® *SpellStar,*® and *MailMerge.*® And the Epson also allows you to add *MS*™*-DOS* compatibility, so you have access to best-sellers like *Lotus*® *1-2-3.*®

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10 LET X=LOG(2250/5)*SQR(267.93198#)
20 LET Y=EXP(4)/3.639876700000002#
30 LET Z=(6233+328)^.5
40 LET K=(X-Y-Z)
50 PRINT CINT(K)
Ok
RUN
 4
Ok
```

puter companies ask you to pay extra for features like these. Most can not offer them at any price.

That, too, is performance. The kind of performance that can make choosing a personal computer very simple, indeed.

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"The Epson QX-10 is soundly designed and executed. I looked hard and found no evidence of kludging or shorting out anything in the name of economy. All the connectors have gold on them and are of quality manufacture. The printed circuit boards are heavy, with soldermarks on both sides of double-sided boards. The circuit boards are completely silk-screened with component labels, and the layout is as professional and clean as you will find anywhere."

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**For technical specifications, and the complete, 3-part *Microcomputing* review, along with the name of your nearby Epson dealer, call toll-free (800) 421-5426. California residents, call (213) 539-9140.**

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Richard Loeh

# EPSON
## STATE-OF-THE-ART...SIMPLICITY.

CIRCLE 165

discover so many new things you can do that you wind up not saving any time, but getting a better product."

In helping to quantify how sick hospital patients are with computer graphics, the Horns make use of a procedure called "cross-hatching" to visually differentiate categories. Clustered bar charts compare the variety of different ways of looking at the question of severity of illness to show the results of different types of grouping systems within institutions. Stacked bar charts are used for data showing how distributions of severity of illnesses differ across a number of hospitals.

The Horns have also found that computer graphics enable them to manipulate facts and figures in a much more organized and efficient manner. How efficient? "We enter data for a whole run at a time," says Roger. "When that's done, we can turn the job of producing charts on the plotter over to assistants such as our children. They don't have to know how to program the computer or interpret data. All they have to do is push buttons in response to screen menu choices in order to make the charts come out."

Previously, the unenviable task of manually producing graphs and charts for presentations fell upon the University's graphic arts department. "They were good," Roger points out. "But it took a week or more to get several done. It would cause no small consternation if we dropped off 30 or 40 of them to do." The graphic arts department now photographs the plotter printouts to produce the presentation slides—a one-day turn-around in most cases.

The graphics software used by the Horns saves them time in entering and storing information as well. The program stores information regardless of chart format, and there is no need to redraft entire charts in order to update them. The Horns can add data to be included in the charts by simply entering the new information in the program. A companion software package called Sign-Master is used for text-only slides.

Many of the graphic presentations produced by the Horns are being used at meetings with government officials to help investigate the possibility of devising a demonstration project to compare the severity of illness approach to the existing fee system. Their ability to utilize computer graphics to cut through masses of complicated data may well result in a more efficient slicing of the health-care pie—a pie chart which garners a lot of attention.

"The way this pie is divided among health care providers," says Susan Horn, "is of intense interest to each of the 5500 hospitals around the country."

## The Computerized Connection With Wall Street

For stock traders, it isn't always easy to get to Wall Street. After all, the famous center of international finance keeps regular business hours—probably the same hours you're busy working. And then there's the time involved in placing an order, not to mention the frequent delays in getting important information back and forth. Wouldn't it be nice if Wall Street came to you once in a while?

With the help of any personal computer and a service called Trade*Plus, it can. Trade*Plus lets you buy or sell stocks and options right from your living room at any time of the day or night—seven days a week. This home brokerage service is being offered through C.D. Anderson of San Francisco, the West Coast's largest independent discount broker, as the first home-brokerage computer system.

To subscribe to the service, you must pay a one-time sign-up fee of $195 for access to the Trade*Plus system. Using a modem (300 or 1200 baud) and any personal computer, you log onto the TeleNet system and then, with the proper information, link up with the Trade*Plus system through TeleNet. If you're an IBM or Apple personal computer user, a software package which will automatically connect you with Trade*-Plus is included in the sign-up fee.

Once you're linked into the system, screen prompts ask you if you want to buy or sell, the company name, the number of shares to be sold or purchased, the price you want to pay, whether you're using a cash or margin account, and if the entry is a day order (tracking a stock for one day only). The Trade*Plus service will then ask for your password, and redisplay all entered information so you can check it one last time. After a final OK, the order is printed out at C.D. Anderson's wire room, and wired to the appropriate stock exchange.

When an order has been entered, confirmation of that order is flashed on the computer display only minutes later, or appears in message form the next time you log onto the Trade*Plus system. The order to buy or sell stock is also confirmed through the more traditional procedure—in writing, through the mail with a notice from C.D. Anderson. Trading stock by computer also lets you have your portfolio in front of you at all times, so you have available a record of your investments which is automatically updated when orders are placed and can be printed out whenever a hard copy is desired.

Derek Anderson, president of C.D. Anderson, sees stock trading at home by computer as a natural outgrowth of widening personal-computer use and a move toward giving people more control over their money. After teaming up with Trade*Plus, Inc., Anderson decided to expand his services by computer instead of opening more offices.

"I did not want to have a far-flung

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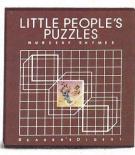
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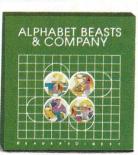
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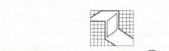
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physical branch office system," he recalls. "And, like a lot of other people, I believed that the usage of personal computers would continue to grow. I also believe the personal computer is a solution looking for a problem. And with the tremendous growth of money market funds and IRAs, I felt it was only a matter of time before individuals used the computing storage power of a personal computer to manage their own financial futures. So I felt that dovetailing traditional stock brokerage services with a personal-computer system would be a logical extension for both a brokerage firm and a personal-computer user."

Anderson points out that the automatic updating of the stock trader's portfolio, as well as the automatic dating of entries, helps the investor keep track of his financial condition more closely, including being able to analyze the tax consequences of his transactions. And in addition to getting up-to-the-minute stock quotes, instant order entry, an updated portfolio, and an order turn-around time of three minutes or less, Anderson sees another advantage: no interruptions.

"Whenever there is a market event, the user will not get a busy signal," he says. "They will be able to come into our order room regardless of how busy or slow things are. Sometimes, when there is a major event such as when President Reagan was shot, or some unforeseen event of international or national importance, people will call their brokers and try to place orders, and of course all the lines are jammed up. This will never jam up."

The Trade*Plus service was developed by Trade*Plus, Inc. president Bill Porter, who contacted Anderson about three years ago with the idea for stock trading by computer. Porter says he approached C.D. Anderson with the idea because it is a "very progressive" discount brokerage firm that was close to home. Trade*Plus is based in Palo Alto, Calif., only

a short ride from San Francisco.

"It was great," recalls Porter. "I called him (Anderson) up and said, 'You don't know me, Derek . . . but I have an idea that has to do with personal computers and stock trading, and I'd like to come in.' So I went up and we spent an hour or two talking through the thing, and he said 'Let's go.' And it's been 'go' ever since."

Porter sees stock trading by personal computer as a boon to both the discount broker—a broker who takes orders from customers without providing consultation or advice—and the individual stock trader, for the



**Bill Porter's and Derek Anderson's companies have teamed to offer consumers a home brokerage service.**

same basic reason: The system gives many traders a more timely and convenient way to invest their money. "This gives the discounter even more leverage in the marketplace because it adds a degree of service that no one else is able to offer at the present time," says Porter, noting that business has been brisk. "It's been really terrific. A good measure of that is that we've had virtually no cancellations of the service."

The Trade*Plus system, which plans to expand to other discount bro-

kerage firms in the near future, is not for every investor, however. Anderson says that computer trading, like other forms of discount brokerage trading, is for "individuals who make their own investment decisions," and not for the investor who frequently wants the counsel of a full-service broker. Discount brokerage firms like C.D. Anderson currently handle about 15 percent of the stock trading by individuals.

Line charges for use of the around-the-clock service are 40 cents per minute during business hours and 10 cents a minute during evenings and weekends. The cost of your personal computer, the Trade*Plus service, and line charges can be counted as tax-deductible items, according to Anderson, if you're using your computer primarily for investment purposes.

Of all the advantages of computer stock trading, convenience is certainly the most compelling. Leonard Schwarz, vice-president of marketing for Trade*Plus, which operates in 300 cities and towns across the country and in 46 countries worldwide, sees the pattern of order entries as sufficient proof of that.

"We are used in these towns I've never heard of before . . . by people who seem to feel that this is their best access to Wall Street," explains Schwarz. "We have customers in metropolitan areas, but we have a disproportionate number that are really in the sticks. And that seems to be because this is a way they can get timely information and act much more quickly than they feel they can in their towns.

"A lot of the order-taking takes place at night and on weekends," he continues, "leading us to believe that we have a lot of very busy doctors and businessmen who don't have time for the stock market during the day and want something they can use at their convenience."

Schwarz predicts that services similar to Trade*Plus will become

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commonplace within two years, based on the initial responses of investors. "It's been very, very well-received," he notes. "The sizzle of Trade*Plus is that people do like to trade stocks—there's a lot of action out there. I think a need has been met, and I think that's why we'll succeed. And that need is to have information when you want it, easily, with the ability to place orders at that moment. And that moment can be 2 a.m. or 2 p.m."

Anderson, who characterizes his competitors' reaction as "one of surprise and admiration," says that other discount firms have been working on developing a computer trading system similar to Trade*Plus but none have introduced one as yet. "A lot of people make noises," he says, "but so far nobody's done it." Nevertheless, Anderson points out, computer stock trading is here to stay and is a significant innovation in personal finance.

"It's the first time in history that individuals have had their financial destiny at their fingertips."

## Doing Something To Save Energy

Ever since the oil and gas crunch of the early 1970s, Americans have been paying very close attention to the amount of energy they use as well as how much they save. The reasons for this concern are many—cost being chief among them for most people. But what to do about the amount of energy you waste in your home is a tough nut to crack.

In Palo Alto, Calif., the city's utility department decided to do something about helping residents not only learn more about their energy usage, but do something to eliminate waste. The department introduced "Michael the Energy Mastermind," a computer which travels from elementary school to senior center to hardware store, educating people on how

Sam Mahany-Braithwait mixed the public's need for energy information with a tool that would attract their attention.

to cut their energy use.

Named after Michael Phelps, the 24-year-old Stanford graduate who programmed it, Michael the computer was purchased last summer as part of a two-year pilot program to save energy. The project, funded jointly by the utility department and the American Public Power Association in Washington, D.C., was initiated to give residents the chance for a hands-on energy lesson, complete with energy-conserving tips and quizzes. The inherent pull of the personal computer, it was hoped, might succeed in enticing people to rethink their energy-spending ways where more traditional methods, such as fliers and mailers, had failed.

The strategy worked. "People love computers and are attracted to them," says Ms. Sam Mahany-Braithwait, coordinator for both the project and the utility department's conservation services program. "I knew there was a target audience I wasn't reaching with bill inserts, so I tried to look for a more creative way. I put together a need for energy

information with a tool that was agreeable to the public." In this case, the tool was an IBM Personal Computer.

In the few months Michael has been "on duty" in the city—since late October—Mahany-Braithwait has seen the number of people requesting an energy audit jump from the mailer's 3 percent response rate to 36 percent. Michael has only to sit in a hardware store, obscure corner or no, and people flock to him, attracted by the intrigue of a computer.

Phelps's programs infuse what could be a dry subject with a lively playfulness. Michael the Energy Mastermind's repertoire currently includes four programs, with more being added all the time. Two "challenge" programs ask you to make guesses on your personal energy consumption for both water heating and space heating. An energy IQ quiz asks questions such as, "What uses more electricity: your freezer, your clothes dryer, your refrigerator, or your television set?" (The answer, if you didn't know, is your refrigerator.) A fourth program presents information on the principles of heating.

People using the program are asked to supply some basic information on their homes—number of bedrooms, number of people living there, square footage—and, in reply, are given tips on improving their energy efficiency. Michael might advise them to wrap their water heaters with insulation, for example. And if Michael is in a hardware store at the time, he'll even direct people to the proper aisle to find the supplies. Whatever his advice, he'll provide the user with a printout to take home.

Michael was a standard IBM Personal Computer, with 64k of memory and two disk drives, when purchased. But as the project progressed, it became clear that more memory would be needed to allow room for all the programs Mahany-Braithwait and

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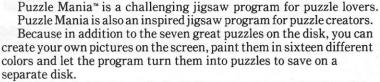
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## A COMPLETE SYSTEM AT YOUR FINGERTIPS

*by David Gabel, Senior Editor*

**W**hen the folks at Dun & Bradstreet decided to get into the personal computer business, it was for a good reason. They felt they knew what people in business needed, having worked with big business for so many years. D&B is one of the largest computer users in the country, operating many large mainframe installations which keep track of major corporations around the country.

So it seemed natural for the firm to enter the market by offering DunsPlus—a full package of computer services—to prospective clients, including *everyone* in the Fortune 1350, according to Bob Pearl, regional sales manager for DunsPlus.

### What do you get with DunsPlus?

When you buy DunsPlus, you get an IBM XT with 256k of main memory, a 10Mbyte hard disk, and a floppy disk drive. You also get an asynchronous communications adaptor, a 300/1200 baud modem, and a color monitor, plus bundled software—some of it developed by D&B, some by third-party developers. As if that weren't enough, you also get your computer installed by the IBM field force. (How many people do you know who had their personal computer installed by IBM?) Then there's the extended warranty. And the hot line, manned by D&B employees familiar with the system, who can help you over any rough spots you might encounter.

"It isn't really just software for the IBM Personal Computer," says Pearl. "It's a complete system—hardware, software, service, and support."

"Wait a minute," you say. "I want more. I want to turn on the computer and have it do its thing without my having to know all about the IBM DOS stuff."

If you indeed say all this, I might argue with your conceptualized grammatical construction, but I can't argue with the sentiment. Who wants to learn all about all that DOS stuff, anyway?

D&B figures no one does, so the firm has wrapped up all the applications into a kind of system integrator that takes away all that DOS stuff. It saves and loads files as it needs to, and it passes data from one application to another without so much as a user-commanded disk access.

### If I can run it . . .

I saw DunsPlus at a news conference at which the package was presented to the world, and then went back to the company for a demonstration of the product. Bob Pearl gave me the demonstration. "This is really neat," he said. "You know who usually gives the demonstrations? It's usually the computer guys. I'm not one of them, so you have to know this thing is easy to use if I can run it."

**DunsPlus, from Dun & Bradstreet, offers the executive a complete system of hardware, software, service, and support.**

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I believed him, and run it he did. He turned the machine on, and the main menu appeared on the screen—in color. Pearl noted that the color is consistent throughout the menu presentations. If commands appear in yellow on the main menu, for example, then they will be in yellow for each menu you encounter throughout the operation of the program. Each menu also displays a menu number so, if you run into trouble, you can call the hot line and tell them exactly where you are.

The system also has as many as 250 Help screens that are appropriate to where you are in the program. If you need help, you just press F1 and the proper Help screen appears to explain what things mean. And, when you're looking at any menu, pressing Escape gets you back to the previous menu. That's handy in those situations where you might have pressed the wrong menu option, and need to get back to where you started.

The first thing we did in the demonstration was to select General Information from the main menu, which includes instructions on using the system and the telephone number of the hot line.

Then we proceeded to some of the packages available on the system. The first one we used was the on-line Official Airline Guide. Accessing this one was simple. First we selected the flight information we wanted from a listing of origin and destination cities that had already been entered. All we had to do was move the cursor down the list of cities until we got to the one we wanted, using the cursor-control keys. When we selected the right one, we pressed Return and then told the system to call the number of the OAG, which had also been pre-entered. The call was placed automatically.

While the system was dialing, it kept us updated on the status of the operation with little messages at the bottom of the screen. Such updates may seem unnecessary to some users, but they are of tremendous benefit to those users who may be a little nervous about computer operations. It's often very easy to get concerned if your computer seems to be taking an inordinately long time to accomplish something. If you know what it's doing, the wait is much easier.

After the log on, searching the data base for flight information was automatic, and the information we were after was quickly downloaded onto a file for later use. Then we logged off.

Then we decided to look at some information on the Dow Jones data base. We simply picked Dow Jones from the menu, and the computer began dialing. After the connection was made, we told the computer we wanted to look at the three-year financials on Dun & Bradstreet, and the information appeared on the screen. It was then downloaded and saved to disk.

Disconnecting from Dow Jones, we decided we wanted to move the information we had just obtained from the

data base to Lotus 1-2-3, one of the third-party software packages available under DunsPlus.

We went into the file-management portion of the 1-2-3 package, which takes over some of the more onerous chores you might otherwise have to perform. One of those chores is formatting data you might have picked up from someplace else (like Dow Jones) that you now want 1-2-3 to handle.

The formatting is accomplished through an editor in which you select those items of information from your downloaded file for presentation to the spreadsheet, and then specify how the program is to handle the data items. To accomplish this, you first move the cursor down the rows of data you've received. In our case, we had a bunch of financial statistics and we only wanted some of them passed to the spreadsheet. So we moved the cursor to each one of the numbers needed and hit Return to select them.



The Public Database Access menu shows the packages available to DunsPlus users. Commands are listed for easy access.

The next step was the definition of the columns of the spreadsheet. Again, you just move the cursor to the appropriate column on the screen. You can specify the type of data to be displayed in the column (text, numerical, etc.), and you can also specify how wide each column should be. After you do that, hitting Return locks the column specifications in. Then, when you enter 1-2-3, you use that program's command line to load the file you've processed with the editor. The file loads under the parameters you just specified, as if you'd built it into the spreadsheet, not downloaded it from a remote data base.

### There's more

The automatic data-base access, through a program D&B developed, and the ability to move the data you get from the data base to a spreadsheet might be enough for some people, but this system lets you do more: It also

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includes the MultiMate word processor, on which you can prepare letters and memoranda. Then you can send the letter you've slaved over to Western Union for distribution through electronic mail. Again the log-on is automatic, and again you select the file you want to transfer to the electronic mail system through a menu-selection process. There is absolutely no need to ever use any of the commands of the operating system; no need to access the disk; no need to ever see an A> prompt.

In addition to using the software that D&B provides, you can also install your own. If you have some pet programs to which you've grown accustomed, you simply select the maintenance option on the main menu, where you'll find an Install option. Follow the system prompts, and the next time you opt for the main menu, you'll see your program listed as one of your options. It's that simple.

"We've aimed this product at people who aren't computer literate," says Pearl. "They're interested in using the computer to help them, but they don't want to learn everything about them to do it." Indeed, you have to learn almost nothing about computers to use DunsPlus.

The system is being sold through a national sales force to large corporations. The single-unit price of the entire system, including training, support, installation, hardware, software, and warranties is $10,200.

Pearl says this is one computer that a company's MIS director won't mind coming into his company. For one thing, the system includes terminal emulation for communicating with mainframes. That means if the company wants the DunsPlus system to have access to its large computers, the MIS department doesn't have to figure out how to do it on the personal-computer end. Also, companies can make a large volume buy, which usually means they can take advantage of volume-purchase discounts.

On the other hand, the system will probably please its users because, while it is tailored for the needs of the organization, it can be customized by installing specific programs for each user's needs.

Thus, you could install an appointment manager that could be running most of the time, quickly exit that program and connect to Dow Jones to get the latest stock quotes of interest and the financials on a company you've been thinking the company should invest in, move those figures to 1-2-3 and play some what-if games with them, then move the results of those calculations to MultiMate for inclusion in a memo to the home office, and send the memo through electronic mail. All without ever turning off the computer, hitting Control-Alt-Del, loading a floppy disk . . . and all that stuff.

**FOR MORE INFORMATION:** DUNSPLUS, A Company Of The Dun & Bradstreet Corporation, 187 Danbury Rd., Wilton, CT 06897; (203) 762-2511

## NEW POWER TO THE IIe

*by Kevin Strehlo, Associate Editor*
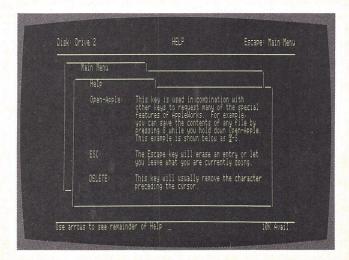
A powerful integrated package with a reasonable price tag is a valuable commodity in today's software market, and AppleWorks, Apple's new package for the IIe, fits the bill nicely. For $250, you get the three major personal computing applications: a word processor that can format text on screen so "what you see is what you get"; a data-base management program; and a spreadsheet with such bonus features as the ability to calculate percentages. What's more, the package provides easy access between files, mnemonic commands that are almost intuitive, and an extensive tutorial to get you started.

Also key to the success of the program, says AppleWorks product manager Don Field, is the level of integration found in AppleWorks. Not only is moving from file to file as easy as pressing Open Apple "q", but on the more specific command level, you'll find many of the keystrokes to be consistent across applications. Open Apple "c", for example, will let you copy text in all three applications—you can duplicate words in the word-processing portion, records in the data-base files, and entries in the spreadsheet portion.

Field says the program's ability to cut sections from one file and paste them into another is one more example of its capability. "Very few programs can do that," he says. Up to 12 files can be in memory at once, and shifting text between them takes only a couple of keystrokes.

Another part of the program's integration involves what you see on-screen. Across the top of your monitor, no matter which of the three applications you're working on, there will be a line that states the name of the active file; what functions you are using (Add Files, for example);



**The AppleWorks Help menu begins by explaining what the Open Apple, Escape, and Delete keys do. Arrow keys move the menu.**

and, in the upper right-hand corner will be a few words on where you'll wind up if you press the Escape key. (With this feature, you'll never have to worry about getting yourself cornered in menu-menu l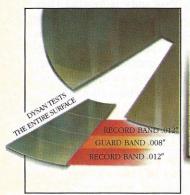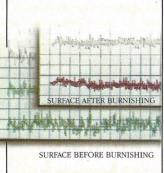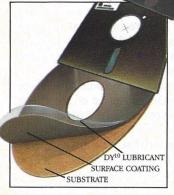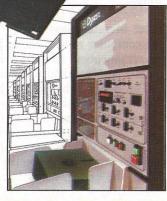and with no way to get out. A quick look up to see "Escape: Main Menu," and you can breathe a sigh of relief.) Another on-screen aid found throughout the program can be found in the bottom right-hand corner—instructions telling you which keys to press if you need help.

### A private tutor

When you're ready to use the program, a tutorial guides you through the booting process. Because AppleWorks runs on Apple's new ProDOS operating system, you have to load a boot disk and then the program disk to get the software running. This is not complicated, but we found ProDOS to be a fairly fussy operating system. Our version, which was a prerelease advance copy, was very particular about the speed of the disk drives; we kept getting error messages, stating the drives could not read the disk.

Field notes that Apple has released a new version of ProDOS which fixes a few of the problems the testers found. This new version will be shipped with AppleWorks, so it is expected the disk speed problem will be cleared up.

AppleWorks uses the increasingly popular concepts of the "desk top" and "file folders" as its unifying framework—metaphors which represent the computer's memory and your data. The first thing you'll see, in fact, after booting the program and giving it a date, is an outline of a file folder, with Main Menu written on the tab, and your options on the "folder's" front.
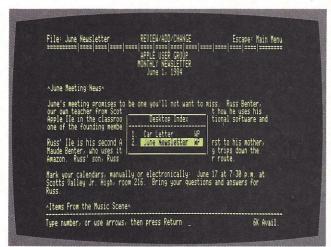
To start, you'll select "Add files to the desk top" by pressing Return. Completing the metaphor, the "Add files" folder will appear on top, covering all of the bottom file but the "Main Menu" tab. If you select the default disk drive from the "Add files" folder by pressing Return, you'll get a third folder, added to the top of the stack. This one is labeled "AppleWorks files," and lists all the files present on that disk. Once you select a file (using the arrow keys and pressing Return), a fourth file will appear briefly on top of the stack, representing the file you'll be working on. This folder disappears once the file is loaded into memory, and you move into the document itself.

The really useful part of all this comes when you have several of these files on the desk top at once, and want to switch between them. Say you're writing a letter and want to look at something from a data-base file—your list of names and addresses, for example. Pressing the Open Apple key and "q" at the same time brings a list of the files on the desk top to the center of the screen. Moving the cursor to the desired file and pressing Return puts you in that file in less than half a second on a IIe with 128k of memory. On a IIe with only 64k, the switch requires a

disk access, but takes less than 10 seconds. Once you find the address you want, the Q command can return you to your original document, with the cursor right where you left it. (It is, by the way, a definite advantage to have 128k to run AppleWorks in. The program is so large that you've only got 10k of desk top to work with on a 64k machine. That means a capacity of about two letters of two pages each.)

From the list of files present on the disk, the AppleWorks tutorial has you call up a newsletter for a fictitious computer user's group from the "sample files" disk. It takes you through various gyrations—changing a Mr. Lawton's name to Mr. Lowder, inserting his phone number—which teach you how to move around in the program.

You can then "zoom" in on data-base files, for example, by pressing Open Apple and "z". In effect, this zooms



Editing a fictitious newsletter in the AppleWorks tutorial gives users experience with the program's functions.
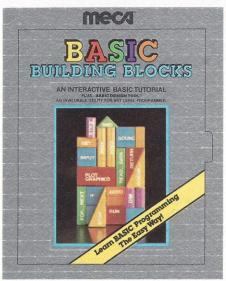
you in from a summary view of all the records in the data base to a look at the full detail of any single record. To get you back to where you were, simply type Open Apple "z", which "dezooms" you back to the summary view. From here, the tutorial shows you several ways to sort your listings.

Placing the cursor within a particular category like "Last name" and typing Open Apple "a" will let you sort by last names. You can choose to sort in ascending order, A through Z, or descending order, Z through A. Numerical orderings are also possible, when applicable. You can sort by more than one category, too, if you wish. State that you want a listing by last name, and then by computer, and you'll end up with a list that groups users alphabetically within groups that share a common computer.

You can also search the data base to find all of the

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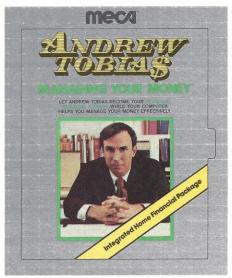
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records containing a particular word. If you recall that somewhere in the user's group data base there is mention of someone able to obtain good deals on disks, for example, typing Open Apple "f" and the word "disk" brings up any record that contains that word.

## Using that integration

The tutorial's first attempt to show the power of its data interchange capabilities is posed in the following scenario: Suppose you are writing a letter of complaint to the car dealer who sold you a lemon. You've been using the database portion of AppleWorks to keep track of all the time you've wasted taking the car in for repairs, and want to use that information to impress upon the dealer just how much trouble you've really had. Just how easy is this data transfer? Very easy.

You transfer from the letter you're writing to a database file on your desk-top called Car Contacts by pressing Open Apple "q". To move that data-base information into the letter requires "cutting" a report from the data base to something AppleWorks calls a clipboard. From there, it can be moved or "pasted" into the letter.

To bring up the report format, press Open Apple "p", then select the option, "Create a new tables format." You'll have to widen the data-base column which contains your comments on the car's repair record, since the comments wouldn't all fit otherwise, so you press the Open Apple and Right Arrow keys, simultaneously. Pressing Open Apple "p" then brings up a menu. You'll select the third option, "The clipboard (for the word processor)." A message will appear on the screen, informing you: "The report is now on the Clipboard, and can be moved or copied into the word processor."

Type the Q command to move back to the letter, then Open Apple "m" to paste that report into the letter. From here, ordinary word-processing commands can be used to delete those sections of the report you don't want, or to otherwise edit the text.

The software includes the capabilities for making headers and footers, automatic printing of page numbers, sub- and superscripts, underlining, boldface, centering, right justification, and proportional spacing. An especially nice feature is the "bullet" feature, which puts the bullet character on the screen just as it will be printed, and holds the indentation you indicate rather than returning to the left margin, the way many word processors do.

Although the word processor seems quite reasonable, there are some things it is not designed to allow you to do. For instance, you cannot merge a mailing list on the data base into a form letter for a mass mailing, although product manager Field says such a capability is likely to appear in a future AppleWorks release.

The spreadsheet turns out to be as powerful as the rest of the program. Zoom commands pull you in and let you see the formulas you've told the computer to use; Open Apple "d" will let you delete, just as it does in the word processor or data base. Yet the structure is set up the same as most spreadsheets—you work on a grid, which you set up in any way you like, spacing rows and columns to suit your needs. You also set up your own formulas, telling the program what you want it to do with all your numbers—add them up in each row and figure an average, for example.

For small applications, learning to use the spreadsheet application may be more trouble than it's worth. According to Field, spreadsheets are especially valuable for generating what-if scenarios. Say you're a teacher and you want to get a sense of what the class average would be without those five high-scoring students; the spreadsheet portion of AppleWorks could tell you.

But, according to Field, if you hope to whiz through your first spreadsheet package in an hour and benefit from it, you're being unrealistic. "If you use a spreadsheet a lot, say more than an hour or two a day, you'll be using many of AppleWorks's advanced features within a week or two. If you only use a spreadsheet occasionally, though, you're going to have to make a concerted effort at the start to spend time in the program if you ever want to do much more than basic adding and subtracting."

He recommends going through the tutorial to gain a good idea of how the program's functions work. But even that won't teach you everything; you won't be able to exploit the program's capabilities, he says, until you begin to use it for your own purposes.

Field puts it this way: "Do you keep riding a bicycle or do you make the effort to learn to drive a car? The idea is to make it flexible enough so that once people start using it, they can *really use* it for the application they have in mind."
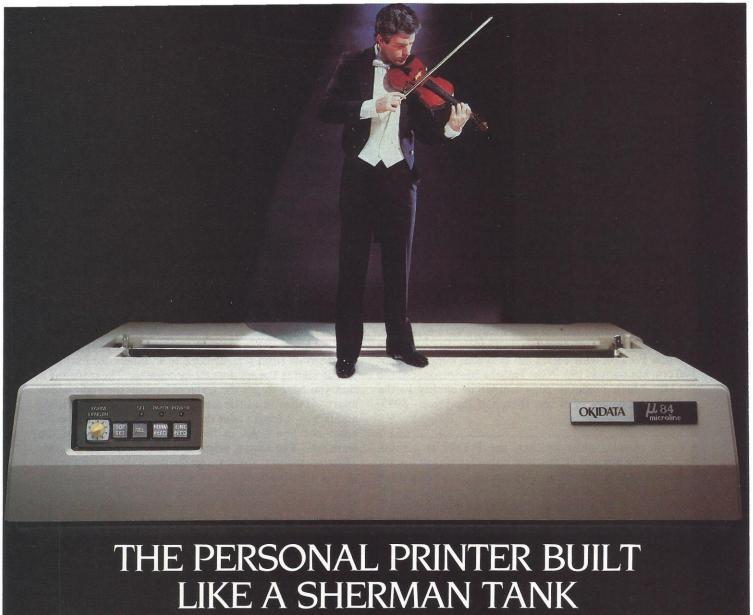
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## HIGH SPEED AND LETTER-QUALITY PRINTING AT AN AFFORDABLE PRICE

*by Charles Rubin, Associate Editor*

**N**ot long ago, dot-matrix printers were synonymous with high-speed, low-quality output. They spewed out copy quickly enough for people in a hurry, but the printing wasn't exactly suitable for a business proposal or a resume.

Marketing managers coined euphemisms like "correspondence quality" or "near letter-quality" as more tasteful descriptions of dot-matrix printing that was nonetheless instantly recognizable as second-rate when compared to the work of a typewriter or daisy-wheel printer.

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And so all of us were left with a painful choice between the unimpeachable quality of plodding daisy-wheel printers, with their slower speeds and higher prices, or the graphics capabilities, higher speeds, lower costs, and, alas, "correspondence-quality" printing of dot-matrix machines.

Early last year, dot-matrix technology advanced to the point where some printers could produce copy that was virtually impossible to distinguish from what a daisy-wheel unit could do, but the early models were expensive. The most popular of these early models has been the Toshiba P-1350, which spits out gorgeous copy at about 100 cps, but costs $2195. Now Toshiba has introduced the P-1340, which produces copy similar in quality to the P-1350, but comes in at less than half the price—$995.

### No nonsense

Like its popular older brother, the P-1340 is a solid, business like product. It features either friction or tractor feed, two switch-selectable character sets, and three pitch settings (10, 12, or condensed). It will print at speeds ranging from 56 cps (letter quality) to 112 cps (draft quality).

You'll encounter no surprises in setting this printer up, because it comes fully assembled. The hinged cover wasn't designed to be removed, which means it's less likely to rattle than the removable covers on some other printers. There's a foam rubber seal where the cover meets the base of the unit, eliminating any potential rattles from this area—this no doubt contributes to the

For under $1000, Toshiba's P1340 dot-matrix printer offers graphics capability in either draft- or letter-quality modes.
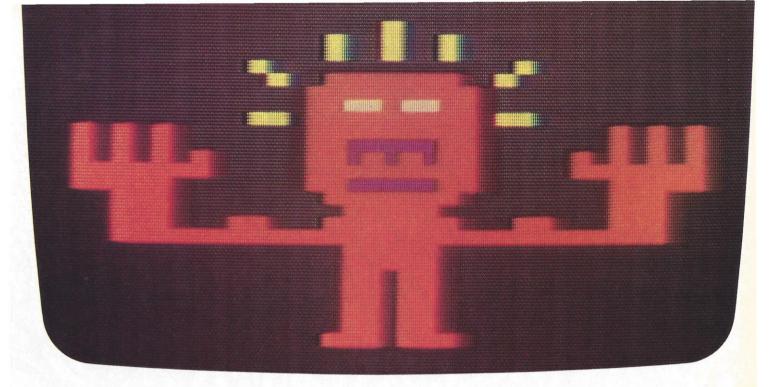
P-1340's quiet operation. No matter whether you're printing in draft- or letter-quality mode, the printer generates only 62 decibels, which is only 4 Db louder than normal conversation.

To begin using the printer, you need only remove the cardboard shipping inserts and tie-down to free the printhead, insert the ribbon and paper, and turn the power on.

If you've never used an adjustable tractor mechanism before, you may have to fiddle with the tractors on this printer to get the paper feeding smoothly. Adjustable tractors allow you to run different widths of paper, so you could switch from regular bond to 4″ labels, for example, just by sliding the tractors closer together. The trade-off is that you have to get the tractors exactly the right width apart—if they're a little too close, your paper will wrinkle and jam as it feeds under the platen; and if they're too far apart the line holes in the paper will tear out of the sprockets. The saving grace is that once you've got this adjustment right, you just tighten down the locking knobs on the tractors and you shouldn't have to touch them again unless you change paper sizes. The paper itself feeds in through the rear of the printer, rather than from the top.

Loading the paper from the rear of the unit, or the bottom, rather than just having it feed into the back side of the platen from the top, is seemingly becoming a trend in printer designs, but I'm not sure it's a positive step. With the paper feeding in from the rear, the tractor mechanism can be placed behind the platen, which means it can be hidden from view underneath the printer cover. With the paper feeding in from the top, the tractors have to be a little higher than the platen, so that they must stick up above the rest of the printer. Apparently some printer designers are worried about the aesthetics of a naked tractor mechanism sticking up above the rest of the printer, and are opting for rear feeding. But with this approach, the paper is a little more difficult to load, and is somewhat more likely to jam. The section of printer housing that hides the P-1340's tractor mechanism from view snaps off so you can get at the tractors when loading paper.

One final problem with the P-1340's paper-handling design is that the tear bar on the lid comes very close to the platen. Unless you have a piece of paper fed past the tear bar, the paper coming off the platen may jam up inside the lid, because there's so little room for it to exit the printer. To make sure you don't have a paper jam, you have to start all printing with the second sheet of paper from the end to ensure continuous flow out of the machine. This means you always waste one sheet of paper. Once you get used to these paper-handling idiosyncracies, however, you'll find that the P-1340 delivers superb print. Toshiba accomplishes its letter-quality printing with a

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*March 1984* PERSONAL COMPUTING **43**

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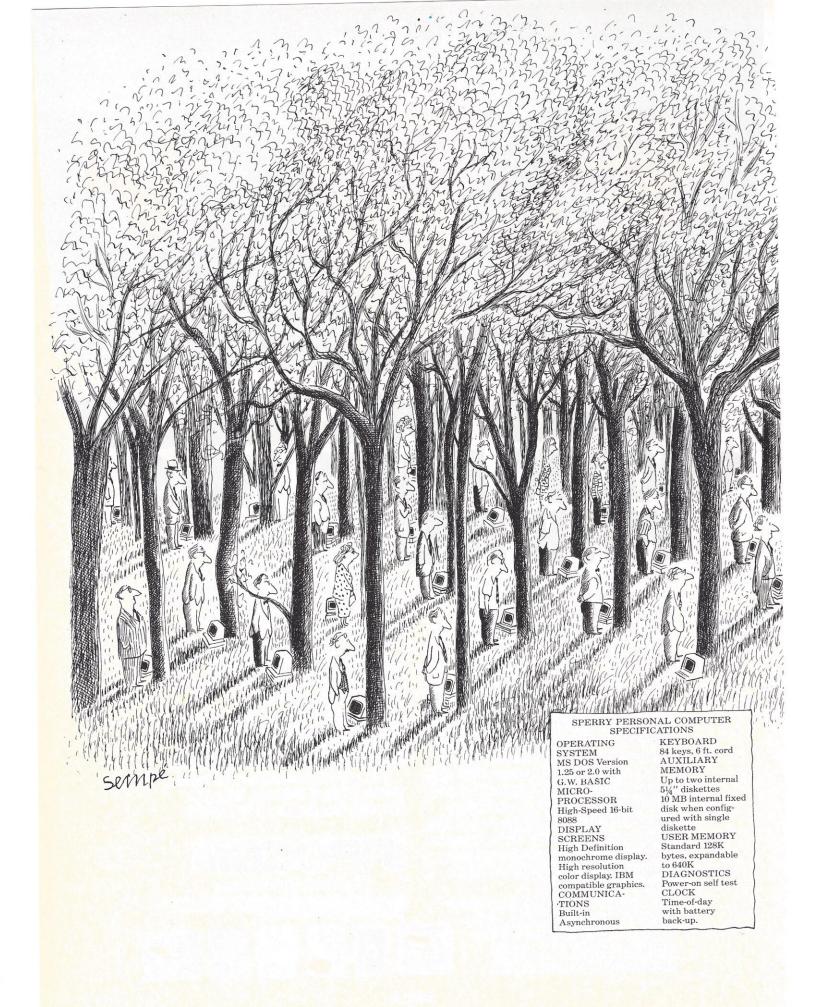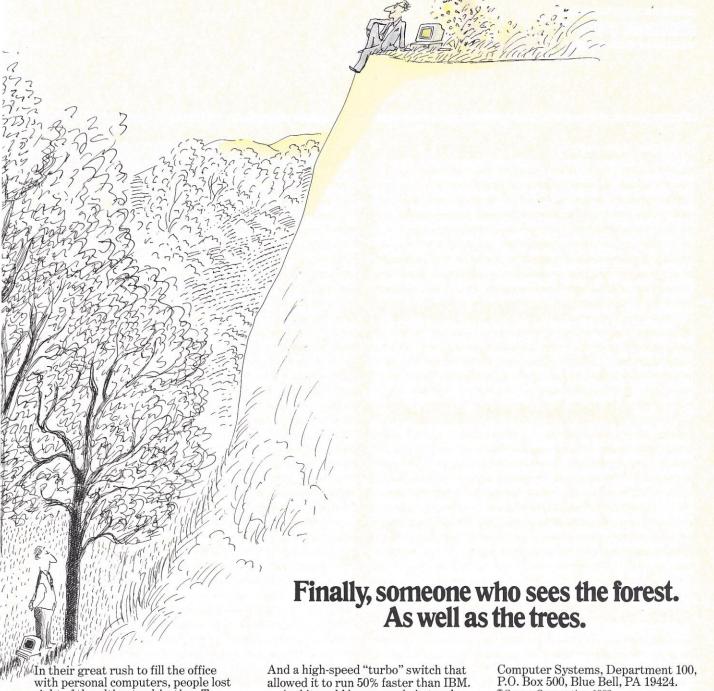In their great rush to fill the office with personal computers, people lost sight of the ultimate objective. To work together more productively.

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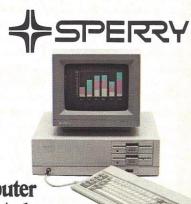
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## The Sperry PC.
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slightly different type of print head than you'll find in most dot-matrix printers. Competitive printers which offer high-quality printing modes accomplish more fully formed characters with what's called double-pass printing. Characters in a line are printed once as the print head moves in one direction, and then reprinted with a slight offset as the print head moves back in the other direction. Since the two impressions are slightly offset from each other, the dots in each impression overlap one another, filling in the spaces between dots so that the character appears fully formed.

Toshiba's P-1340 provides the same quality with a single pass of the print head. Instead of printing the characters twice, slightly offset from each other, the Toshiba print head itself contains pins that are offset from each other. Most dot-matrix print heads print a grid of either 7 by 9 or 9 by 9 dots, but the Toshiba P-1340's matrix is 24 by 18 dots.

You might not care whether it takes one pass or two to create letter-quality printing, but single-pass printing is almost twice as fast as the double-pass method. This is why the P-1340 is capable of printing letter quality at up to 60 cps while other matrix printers in this price range usually perform in the 35 to 40 cps range. At 60 cps, the Toshiba printer gives you letter-quality copy faster than daisy-wheel printers costing twice as much or more.

In addition to their letter-quality density, this printer's characters are well-designed. Because of its larger dot matrix, the P-1340 will print true descenders on letters like g, j, and y. It will also handle super- and subscripts with ease.

### Easy software control

Although most dot-matrix printers are capable of printing boldface, underlining, and super- or subscripts, getting them to perform these feats with your software can be a chore, requiring you to send special control character sequences to prepare the printer for such acrobatics. Most word-processing programs contain auto-configuration options for the most popular printers, though, which means the control characters are automatically sent for you when you specify special printing from within the word-processing program.

If you indicate boldface print in a word-processed document, for example, the software automatically sends the appropriate control characters for the printer for which your software is configured. Some of the popular printers almost universally supported by word-processing software are the Epson, Diablo, and Qume. The Toshiba P-1340 emulates a Qume Sprint 5 daisy-wheel printer, which means you can configure your word-processing software to drive the printer as if it were the Qume unit.

To change from letter-quality printing to draft-quality,

you can use either an internal DIP switch or software commands that override the switch settings. The P-1340 has three user-selectable DIP switches located underneath the print head rail, tucked away under a couple of rubber flaps. There's a photograph in the manual that shows which switch controls which function. Using these switches, you can alter the font, pitch, auto line-feed after carriage return, baud rate (from 110 to 9600 baud), and bit parity. There are also some convenience defaults you can set, like having the printer go into Select (or Ready) mode automatically when you turn the power on.

In keeping with the other features of the P-1340, the letter-quality font is a businesslike 10-pitch Courier design. This is a good choice, as it is probably the single most popular typeface for business use.

The draft font is a bit less conventional. Draft-printing speed is nearly double letter-quality speed, and this speed difference is achieved because each character contains fewer dots in draft mode. The characters are consequently thinner, less fully formed. Other compromises in the design of the draft character set are apparent—the descenders on the j's and g's are shorter, for example. Perhaps the most disconcerting feature of the draft font is the letter o, which for some reason is larger than the similar g or e characters. This makes the o's in your document tend to stick out. Of course, you have to keep in mind that draft quality is for drafts—the type is perfectly readable, and you get it at about 110 cps.

Speaking of speed, the P-1340 features a buffer of only 256k, which is sure to provoke mixed reactions, depending on whether you want your printer to run awhile on its own or stop quickly when you tell it to. With a 256k buffer, you could issue a "stop printing" command from your software and have the printer stop within 3 lines, on the average. A printer with a 2k buffer, on the other hand, will continue to print for about a page after you tell it to stop.

But another consequence of this is that the P-1340 needs to receive data from your computer almost the entire time it's printing. Your computer transfers data to the printer much faster than the printer can crank it out, so this means tying up your computer for a longer period of time. With a larger buffer that could store a larger amount of the computer's data, printers run by themselves and return control of your computer to you sooner. It's a matter of which capability appeals to you more—having a printer that responds quickly to a "stop" command (which the P-1340 does), or having a printer that can store a large amount of data and print it out without the computer's help.

The front control panel on the P-1340 is fairly standard —it contains paper feed, print test, top of page, and select/de-select switches with lights to indicate power-on, paper end, select, or other alarm conditions. The power

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switch itself is in the back, a standard location for most printers. As for operating life, Toshiba tells us that the print head has a life expectancy of 100 million characters, and that ribbons should last from 1 million (letter quality mode) to 2 million (draft mode) characters. When the print head wears out, you can exchange it for a factory rebuilt one for $99. This is actually a little steep for a print head, but that's the price you pay for the finer print needles and denser matrix that produces the P-1340's excellent print quality.

In the end, the decision behind any printer purchase involves speed, print quality, and price. You can certainly buy cheaper printers than the P-1340. A $300 dot-matrix printer will offer second-rate output and reasonable speed, while a $600 daisy-wheel printer will offer first-rate output at a snail's pace. The P-1340 from Toshiba gives you first-rate printing more quickly than almost any daisy-wheel printer available, and it throws in graphics capabilities too. For under $1000, it should be a serious contender for anyone who needs high quality and doesn't want to wait forever for it.

**FOR MORE INFORMATION:** TOSHIBA AMERICA, INC., Information Systems Division, 2441 Michelle Dr., Tustin, CA 92680; (714) 730-5000
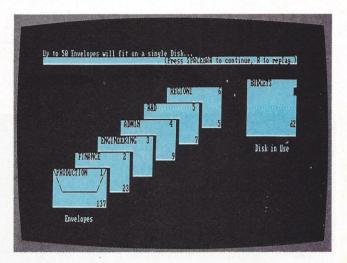
## AN UNCONVENTIONAL APPROACH TO INTEGRATED APPLICATIONS

*by David Gabel, Senior Editor*

One of the newest integrated applications packages, Jack2, comes from Business Solutions—a company whose headquarters is in the unlikely spot of Kings Park New York, about 60 miles east of New York City. If it's unconventional for a software company to have its headquarters in what is otherwise nothing more than a bedroom community, then Jack2 is equally unconventional. Its authors have eschewed what is becoming the conventional wisdom in integrated packages by skipping the window approach, opting instead for a single-screen or "page" approach, in which you see everything the program can do—word processing, data-base management, spreadsheets, and graphics.

There are no strange commands to learn, no arcane rituals to be performed. All you do is follow menus, answering the questions they ask, and you get the results you want. You can save a document containing a spreadsheet, graph, and text at any time, and you can print it all out, provided you have a printer that the program supports.

Quite frankly, I've often wondered whether the integrated application window people aren't on the wrong track. They maintain that windows provide an accurate metaphor for the desk top: When you're finished with a particular piece of paper on your desk top, they say, you



Jack2 lets users put documents into envelopes, or files. The disk tells users which main file they're in.

can put another on top, represented on the computer by another window which resides "on top" of the previous document/window you were working on.

Have you ever tried that on the top of *your* desk? Of course you have. And you wind up with a lumpy work surface that you can't write on, because your pen or pencil pushes through the top piece of paper. The end result is a document full of holes—literally.

To remedy the problem, most people simply push the previous document off to the side, leaving a clear space for the new item they want to concentrate on.
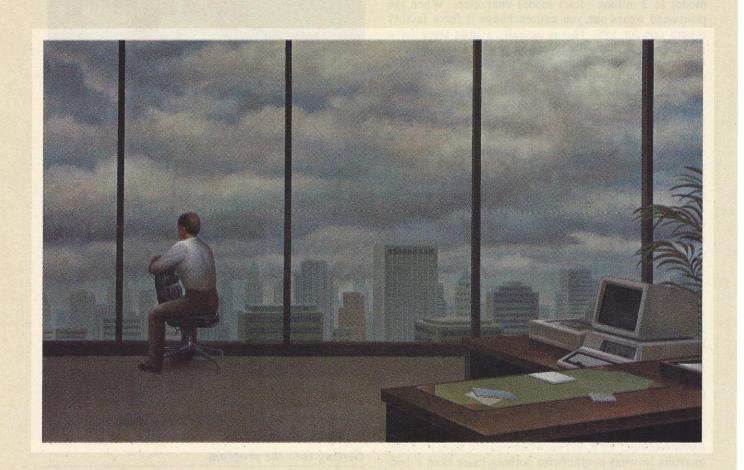
This is the idea behind Jack2. It gives you that one space—that neat, clean, single area—in which you can do *all* your work.

### Getting into the program

When you boot Jack2, you see a title page with the word "Jack" bouncing around the screen in a reasonably random fashion, then filling the screen. When the screen is full of Jacks, the program toots the speaker in a nice tune "just to let you know there's still something going on," says Alan Dziejma, president of Business Solutions, who demonstrated the package for me. After hitting the space bar, Jack2 started to do its thing.

A screen appears, with a menu and a picture of two floppy disks. One of the disks is your program disk, and is labeled Jack2. The other disk is labeled with the name of whatever file disk you've placed in Drive B. In this case, the disk is called Rabbit—clearly an allusion to Jack2's logo, which shows a running jack rabbit.

Moving right along, you select the disk you want to look at by moving a small arrow at the left of the disk icons—the pictures of the floppy disks. Using the up and down

## It promised to take the work out of work.

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**A**pplications appear on the screen as windows, representing workspaces. To open a window, you point a hand-held pointer called a "mouse." Two buttons on the mouse control your options.

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CIRCLE 18

# PERSONAL COMPUTING

# Why So Many Computers Look Like The "IBM Standard"

### The issue centers on which operating system should be the industry standard. It's a high stakes game where the winner takes all

*by Charles Rubin and Kevin Strehlo, Associate Editors*

In 1981, the personal-computer industry was at a crossroads: 16-bit microprocessor technology was on its way, but it's impact wouldn't be felt until software was written to take advantage of the more powerful chips. Hardware and software developers eyed the new processors anxiously, dreaming about their advantages over 8-bit technology. Anxious as they were, though, they hung back, waiting for an operating-system standard to emerge. Software written to run on one operating system generally won't run on another operating system (see box titled "What is an operating system, anyway?"), so nobody wanted to spend a lot of development time on a product, only to find they'd guessed wrong about which operating system would emerge dominant. Apple liked keeping its technology to itself; so did Radio Shack. There were lots of other companies adhering to the old CP/M-80 standard, but none of them was big enough to gamble on.

Then IBM chose PC-DOS, and Microsoft sold its version, MS-DOS, to the masses, and everybody breathed a sigh of relief that a standard had at last been established. Since that watershed period, IBM has captured a significant market share and the attention of America's largest corporate customers, so virtually everyone else in the single-user, business personal-computer market is fighting for a grip on Big

Blue's coattails. And the result is that you, the consumer, can go out there and choose from dozens of different computers and hundreds of software packages, but the chances are that what you're choosing from will look something like this:

- Operating system: PC-DOS or MS-DOS
- Processor: Intel 8088 or 8086
- Disk Drives: $5\frac{1}{4}''$, 360k capacity
- Keyboard: detachable, with at least 10 function keys
- RAM: 64k minimum, expandable.

IBM whistled, and everybody responded with products that more or less resembled or were designed for the IBM Personal Computer, and thus a standard was born—not because sober consideration had revealed PC-DOS or MS-DOS as the friendliest possible operating systems, or because they were the easiest or most flexible environment under which to develop software; not because the disk drive format was the best available, or because everybody liked the keyboard; not because the 8088 processor is or was necessarily what people need; but because everybody knew IBM would sell lots of computers, and that meant lots of software, peripherals, and compatible-computer sales. Things have snowballed to the point

where today, according to one market researcher, 85 percent of the software being developed for personal computers is for PC-DOS and MS-DOS, and it has been considered suicidal to contemplate entering the marketplace with anything but an MS-DOS compatible computer. Apple's Macintosh, which isn't compatible, is formidable enough to have a good chance of changing the industry's mind on this score, at least for companies with sufficient clout and technology, but it's the first significant countercurrent

since the IBM wave began to roll.

So we have an industry standard by virtue of IBM's hardware and operating system choices, and because IBM's influence in the market is enormous. But is rallying around this—or any—standard a good or bad thing for the industry and the consumer? Strong arguments can be made both for and against standardization.

Yes, you could say, standardization has made small computers seem a safe investment for corporate America. Yes, the standard tends to erase differences between various computers, and stimulates price competition; more important, the standard is a strong catalyst for development of applications programs. With a broad market of customers using a common operating system, software companies can concentrate their efforts on that one market, intensifying the competition to bring out new products. We have gained more diverse choices of better software.

But for each of these unquestionable benefits there is a nagging drawback. Reliance on IBM to set the standard means reliance on IBM to introduce improvements—and IBM has traditionally announced improvements in its products only in reaction to competition. By and large, the more any product (no matter how superior) deviates from the standard, the riskier it is to bring it to market. Hardware and software innovation is to some degree cast aside in favor of conformity, and our choices then become more limited. And then there's the quality of the standard itself, which in large degree determines the nature and quality of computing, like it or not. Even personal-computer giants like Apple and Radio Shack, who have always insisted on doing things their own way in the belief that their technology was superior, have been forced to acknowledge this standard—not necessarily because it's the best, but because it's the biggest.
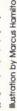
Having committed to this standard, we have all made our choices, at least for a while (the next 12 months, maybe?). That's comforting news for the people who were made uneasy by the diversity of the marketplace in the old days (12 months ago). But many others are concerned, not by the notion of standards, but by this particular standard, which has emerged through a combination of isolated, short-term decisions, mass psychology, and sheer circumstance that none of us—not even IBM—could have forseen.

### Why was MS-DOS chosen?

Back in 1980, there were many manufacturers of 8-bit computers, most of whom had accepted CP/M-80 as the standard operating system. CP/M-80 became a standard back in the pre-IBM days because both Apple and Radio Shack, who sold most of the computers in those days, had proprietary operating systems, and CP/M-80 was the best one available to everybody else.

Then International Business Machines decided the personal-computer market was worth entering. IBM had no prior experience in the market, and while it felt reasonably confident about designing the hardware, it looked to outside experience for the

Illustration by Marcus Hamilton

operating system. The logical supplier was Digital Research (DRI), which had designed CP/M-80. But as it turned out, logic took a back seat to circumstance this time.

As the story goes, IBM set up a meeting with Gary Kildall at DRI in California. On the fateful day, the IBM contingent showed up, only to learn that Kildall was out. The next highest-ranking DRI official happened to be Dorothy McEwen, a vice-president and Kildall's wife. IBM was willing to get the ball rolling without Kildall, but legend has it that no one at DRI would sign IBM's nondisclosure agreement. IBM considered the situation for a couple of hours in the lobby at DRI, and then left.

Kildall, however, tells it differently. He concurs that Dorothy McEwen, the VP who handled all legal matters for DRI, was reluctant to sign IBM's nondisclosure agreement at first, because she and the DRI legal department had never seen anything like it; it did more than just commit DRI to secrecy on the information IBM disclosed. "It says essentially that you give up all rights to anything you disclose in return about your software," explains Kildall. "It says they are free to take any ideas and concepts and use them however they like." Kildall had been around the computer industry longest, and knew that IBM insisted on that "right to steal" clause simply to preclude being hit with a lawsuit accusing the company of stealing ideas. When he joined the discussions late that afternoon, he argued on behalf of IBM's trustworthiness and, given a few alterations suggested by DRI's lawyer, convinced McEwen it would be okay to sign. They reached an agreement with IBM's Sams to sign the modified nondisclosure agreement in two weeks and then proceed with contract negotiations that would put a 16-bit version of CP/M that was being developed on the new machine that IBM might or might not be bringing to market. But when Kildall called Sams two weeks later, he discovered Sams had been transferred to another division, and failed in attempts to reach anyone working on the Personal Computer project.

What happened next is open to dispute. According to people at Microsoft, IBM came to them saying Digital Research would not come to terms, and asked Microsoft to provide a CP/M substitute. Other versions of the story have it that Microsoft seized on the opportunity presented by the internal IBM reorganization and convinced the new powers that be at IBM that they could provide an operating system more compatible with CP/M-80 than the DRI CP/M-86 product under development. In any case, Microsoft was signed to develop PC-DOS, a proprietary operating system for the new IBM machine, and Microsoft in turn had Seattle Computer modify an operating system it had under development to meet IBM's specifications. Microsoft licensed the product from Seattle Computer for $50,000, and then passed the license on to IBM. Microsoft also acquired the rights to a commercial version of the Seattle Computer product, which it dubbed MS-DOS. (MS-DOS and PC-DOS are virtually identical, although there is a critical difference between the

phrases "MS-DOS compatible" and "PC-DOS compatible" that we will get to in a moment.) It was only after committing to PC-DOS and accepting delivery, according to several sources, that IBM discovered from Kildall himself that PC-DOS was in fact *not* CP/M compatible, and gave DRI's CP/M-86 operating system IBM's blessing (and label) for putting it on the new IBM PC.

The result was unusual, because on all previous personal computers, a single operating system had been sold as an integral part of the computer. In this case the operating system was a separate purchase, and IBM was giving people a choice. "But IBM was clearly trying to signal the market that PC-DOS [and not CP/M-86] was the system they wanted used," says Chris Larson, Product Marketing Manager for MS-DOS at Microsoft. "CP/M-86 was $240 while PC-DOS cost $40, all the IBM programs ran under PC-DOS, and PC-DOS was available first. But it took awhile for people to catch on."

Given the confusion, and the fact that people were used to thinking of CP/M as the standard, MS-DOS did not yet represent an obvious, clearcut choice for other computer manufacturers. It was left to Microsoft to sell them on their system. "I don't think there's any way Seattle Computer could have kept the operating system and made it a standard," Larson says. Seattle was a very small company, and it lacked the close relationships with computer manufacturers Microsoft enjoyed from putting its BASIC software on most of the machines on the market. "If Seattle had kept MS-DOS, maybe CP/M-86 would have been dominant," says Larson.

Thus, the combined influence of Microsoft and IBM, both focused behind the new operating system, was the genesis of a new computing world. And so it was that this world saw the IBM Personal Computer, PC-DOS, and MS-DOS, and found them good. (Not great, perhaps, but good.) And the competition followed with Compaqs and Columbias, with Coronas and Eagles, with Chameleons, Hyperions, and TI Professionals. And the software houses went to

work too. There was Easywriter, soon followed by 1-2-3, and WordStar, Multiplan and Perfect Writer, dBASE II, Condor, PFS: File, and Flight Simulator. And the peripherals companies caught on, too.

The impact of IBM's entry into the personal-computer market was swift and dramatic. The most widespread benefit was that its endorsement of personal computers stimulated the rapid spread of them to the desk tops of corporate America. To be sure, thousands of individual managers had been using Apples, Radio Shacks, and other brands, but IBM's entry convinced corporate purchasers that personal computing was here to stay, and that it was no longer a gamble to take advantage of the new technology. With the acceptance of personal computers by large institutions, a much larger percentage of individual purchasers now felt comfortable. Demand for the IBM Personal Computer was so great that at one point there was a backlog of orders several months long. In the years since IBM's announcement of the Personal Computer, the entire industry has

*The biggest problem with the current standard is the non-transportability of software from one machine to another.*

hurried to satisfy the demand. Between IBM's announcement in late 1981 and the end of 1982, about 10 companies had entered the market with more or less compatible MS-DOS computers. By the end of 1983, there were five times that many.

"In 1984," says Chris Yalonis, director of Creative Strategies, a market research firm in San Jose, Calif., "close to 70 percent of the personal computers shipped to the business market will include an 8088 or 8086 microprocessor and have MS-DOS or PC-DOS available to run on them. That's a huge development in a relatively short period of time. These days, a microcomputer product being introduced that isn't from a top 10 manufacturer has to run MS-DOS to be successful." As it happens, market acceptance of the standard is so widespread that even the top 10 manufacturers have either introduced MS-DOS machines or are offering MS-DOS compatibility upgrades for their existing products, even those who have used proprietary systems in the past. Even Apple, which has gone against the rush by using the Moto-

rola 68000 microprocessor and proprietary operating systems as the basis of Lisa and Macintosh, has bowed to the standard by offering a board that will allow the Lisa 2 to run MS-DOS. And Tandy Corporation/ Radio Shack introduced its first computer without a proprietary operating system, the MS-DOS compatible Tandy TRS-80 Model 2000. "This was absolutely a reaction to and a method of leveraging off of the degree of standardization that's been caused by MS-DOS and the IBM Personal Computer," says Ed Juge, director of computer merchandising, business computers, for Tandy Corporation/Radio shack. And with so much movement toward MS-DOS among the hardware manufacturers, the software development community has rallied behind the standard as well.

What all this standardization means to you as a consumer is the security of a market that is significantly more unified than it was in the

old 8-bit days. While CP/M was cited as the business computing standard back then, the marketplace nevertheless offered three major "standards": CP/M, Apple DOS, and TRS-DOS, each of which had certain advantages, and all of which had good software bases. The variety led to often-agonizing decisions about disk capacity, color capabilities, the friendliness of the user interface, and other differences. MS-DOS and the IBM-compatible bandwagon do away with many of these differences, so the advantages of one computer over another are more clearly defined: Price, screen resolution, or perhaps expandability become the main differences. It is analogous to deciding between different makes of stereo instead of figuring out which sound reproduction technology is best for you.

Of course, sound reproduction technology changes at a snail's pace compared with the improvements in computing, and standardization or not, many of the improvements will surface anyway if the company behind them has the resources to promote them. Apple's Macintosh is a case in point. You would think that with the rush toward MS-DOS, Apple's introduction of a computer with a proprietary, non-compatible operating system could be doomed to failure, but it's not as simple as that. Apple has targeted a market segment that doesn't necessarily need the compatibility, and is tempting it with a product that offers many enhanced features. At one of the Big Eight accounting firms in New York, the dominant computer is the IBM Personal Computer, but the firm is nonetheless contemplating the purchase of several dozen of the new Apples. An official at the firm, who asked not to be identified, said the basic compatibility via VisiCalc DIF files or ASCII text files transmitted through telephone modems is sufficient to meet their particular needs. It's not possible to exchange data disks between

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PC-5

## WANG
### The Office Automation Computer People.

CIRCLE 175

*People are interested in using the computer to help them do a job; the question is whether or not the equipment can do it.*

**SPECIAL REPORT**

the computers, because they use different formats and different operating systems, but both computers can use applications programs that create the same types of files. The official also pointed out that the Apples would be used in an entirely different department within the firm anyway.

Assuming you are on the MS-DOS bandwagon, though, you can also benefit from a wider availability of software thanks to the standard. There are a lot of fine programs for CP/M or Apple DOS that were never made available for other 8-bit operating systems because the development effort was too great to make it practical, or the constraints of the other technology made such a conversion impossible. Today's standardization does away, in part, with these problems, because even if, for example, you might need a different version of 1-2-3 for the TI Professional than you would for the Compaq, it's still easier for software developers to create it than it would be for them to rewrite 1-2-3 to run on a different operating system. With a potential customer base approaching two million, most software developers are devoting the lion's share of their resources to MS-DOS/PC-DOS applications.

But if standardization giveth, it also taketh away. Since the IBM Personal Computer and MS-DOS are the centers of the standard, the standard must suffer from the limitations of these products. According to Chris Larson, there were limitations for MS-DOS built right into the original design specifications provided by IBM.

"There were a lot of constraints," Larson says. "The requirement was that the first MS-DOS make it very easy to transport CP/M-80 applications up to MS-DOS quickly and with little effort. Look at the file names, for example," Larson says. "CP/M file names are very similar." This explains why users have to put up with the inconvenience of three-letter suffixes and an eight-character file-name limit.

## WHAT IS AN OPERATING SYSTEM, ANYWAY?

In essence, an operating system is a middle man. It sits between your application program and your computer hardware and handles all interactions between the two. The program makes *generic* requests to send instructions and/or data to a particular kind of hardware (for example, to the display screen, a disk drive, or a printer port). The operating system then translates that request into the *specific* language of the particular hardware.

Most operating systems, including CP/M and MS-DOS, can be divided into two parts. The top part—called the BDOS or (Basic Disk Operating System)—listens to you and your programs and doesn't really change from machine to machine. It allows a program—or you, if the system "prompt" is showing—to address "logical" devices (such as drive A and drive B) so that you, or the program, don't need to consider the physical details of how those devices actually work. The bottom part of the operating system—called the BIOS (or Basic Input/Output System) —translates this logical operating system schema into the actual, nitty gritty detail needed to operate the hardware. Therefore, this bottom part

must change to accommodate different computers. The benefit of a standard operating system is that because the top part always remains the same, the same software can run on a variety of computers.

One glitch in this neat scenario comes when the logical schema of an operating system, the top part that never changes, does not allow a particular hardware device to be addressed in a particular way. The top half of MS-DOS, for example, does not have the "vocabulary" to allow programs to light up individual dots on the monitor screen, so that when a program needs to do this kind of bit-mapped graphic, it has no choice but to talk directly to the screen via the area in memory responsible for that screen image, the video map. The dimensions and location of the video map vary from one kind of personal computer to another (with the exception of IBM-compatible computers). Therefore, MS-DOS software that uses bit-mapped graphics must be rewritten for each MS-DOS computer. CP/M-86 with the GSX extension defines a logical bit-mapped graphical device (or screen) separate from the physical hardware. Commands written for this logical dis-

play are translated into the needs of the actual display by something called a "device driver." Microsoft Windows has a similar feature. Both buffer programs form variations in the way computer hardware handles bit mapping.

A second glitch in this neat two-level system is the overhead required to achieve that very neatness. It takes time for the operating system to translate the logical commands issued by a program into the actual commands needed by the hardware; in the software business, when a program wastes time and therefore runs slower, it usually sells slower as well. If the bottom part of an operating system— normally, the computer hardware manufacturer has a hand in writing this BIOS, and it resides in Read Only Memory (ROM)—is inefficient at translating particular operating-system commands into the language of the hardware, software developers may circumvent it by going directly to the hardware. The program runs faster, but it is locked to that hardware. If the program is to be used on a different computer, it has to be translated, because the buffering effect of the operating system has been sacrificed for speed.

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## ASHTON·TATE

CIRCLE 25

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The computer industry is littered with companies—some now defunct—that have felt IBM's competitive teeth.

SPECIAL REPORT

The CP/M-like appearance of the MS-DOS user interface is another deficiency of the original MS-DOS design which illustrates how the industry's zeal to standardize can have its down side. Tim Paterson, the original designer of MS-DOS, admits he had little time to make the user interface for MS-DOS much friendlier than the one on CP/M. Thus, instead of letting the user type English-like phrases, or choose from menus, or call up Help screens that explained the various commands, the basic "command processor" you deal with when interacting with MS-DOS is virtually identical to the CP/M interface: the letter and caret (A>) that designates the "current" disk drive, next to which one must type *verbatim* such hard-to-remember commands as EXE2BIN, CHKDSK, and CONFIG. "It wasn't designed as the user interface of the future," says Paterson. "We did design MS-DOS with the user interface written as a separate program, though, with the intent that computer manufacturers who wanted to provide a nicer interface could write a new one, if they choose." To this day, no manufacturer has done so, says Paterson, "because it's a lot of work, and IBM decided not to do it. The Personal Computer-DOS interface became something else to standardize on, even though changing that user interface wouldn't require altering the rest of the operating system at all."

The herd instinct that drives standardization has apparently caused even Microsoft itself to withold potential improvements to the user interface of MS-DOS. "When I went to Microsoft to discuss the improvements that should go into DOS 2.0," Paterson recalls, "one of the things we agreed should be in it was a visual interface to replace the original, CP/M-like command processor. Microsoft went ahead and developed something called MUSH that does provide a nice, visual interface, but they didn't put it in 2.0." Although

MUSH would have eliminated the need to learn and remember commands like CHKDSK—certainly an improvement in computing—Microsoft decided not to diverge from the IBM user-interface standard. If you want to know what might have been, you can get an idea by looking at how an offshoot of MUSH is used to ease the task of issuing commands to Microsoft Word.

### Living with IBM's "sins"

Of course, the biggest problem with the current standard is its non-standard aspect—the non-transportability of software written for MS-DOS computers from one machine to another. A primary cause of this is that MS-DOS and PC-DOS have no "bit-mapped" graphics display capabilities. That is, they can handle putting characters of a single typeface up on the screen so an application program doesn't have to worry about the details of how this is done by the particular hardware. But software that draws images by turning on and off the individual dots on your computer screen—this is how pie charts or airplane control panels or a variety of typefaces are produced—must directly alter the individual bits of memory in the "bit map" (or "video map") in the machine that correspond one-on-one to these screen dots. Since the location of this video map, and the way the image is reproduced on the screen from this map, varies from machine to machine, there must be slightly different versions of "bit-mapped" software for each computer. Issuing such hardware instructions directly from the applications program, instead of using mechanisms built into the operating system, which isolate the program from the variations between machines, is called "going around" MS-DOS. Applications called "PC-DOS compatible," as we use it here, are applications that go around the operating system and tinker directly with the hardware.
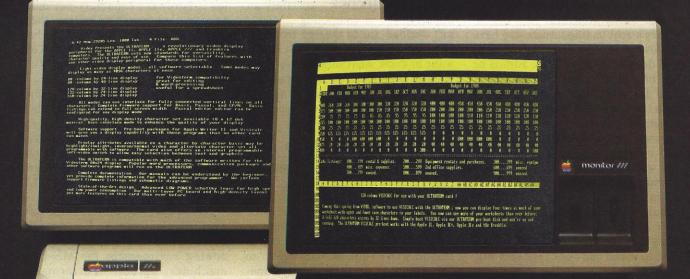
Although software obviously *must* go around MS-DOS when it needs to use a hardware capability not managed by that operating system, there are also performance gains to be had by going around MS-DOS. Kurt Lynn, product manager for VisiCorp's VisiOn, says, "There are a number of cases where we go around MS-DOS. Graphics is the most obvious, because there is no support for graphics in MS-DOS. But we also go around the operating system for our filing, because the filing system and directory mechanism in DOS 2.0 is terribly slow."

Gary Pope, vice-president for software development at Quarterdeck Software, makers of the DesQ windowing environment for MS-DOS machines, agrees. "Performance through DOS is abysmal," he says, explaining that the only semi-effective way of getting characters up on the Personal Computer's screen is by going around DOS directly to the part of the hardware that generates them. Even that, Pope says, isn't very fast. "That's why people like Lotus go directly to the screen for 1-2-3, even in nongraphics mode."

The lack of graphics capability and questionable performance of MS-DOS can be traced directly to the IBM Personal Computer's hardware design, according to George Morrow, chairman of Morrow Designs, which makes computers that compete with the IBM Personal Computer. "There is this phenomenon in MS-DOS," Morrow says, "the IBM phenomenon, and you really have to understand that it came about because of some really bad design defects in the IBM Personal Computer. No one would go around the operating system to get directly to the hardware if software would run adequately without doing it. That's not the fault of MS-DOS . . . the fault is IBM's, and the market tolerates IBM doing that when it would never tolerate somebody else doing it. This is a blot on our industry. Take spreadsheet soft-

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ware . . . if the programmer relied on MS-DOS, the screen updating would be very, very slow. And that's because IBM did not design its BIOS or the hardware as well as it ought to have." (See box titled "Just what is an operating system, anyway?" for an explanation of BIOS.) "And now," Morrow continues, "there's no choice."

In short, IBM's hardware design and the marketing considerations of making it easy to convert old CP/M programs influenced the design of MS-DOS just as IBM's decision to go with MS-DOS influenced the rest of the market. "I don't think having to go around MS-DOS hinders software development," Morrow says, "but whether it was planned or not, it has tended to make IBM the dominant factor in the small-computer market."

The need to write and rewrite applications software for various MS-DOS computers means that the first computer for which software will usually be available is the one with the largest market share, the IBM Personal Computer. It means that any hardware that is not virtually identical to the IBM Personal Computer will not be able to run that software until months later, in most cases, or perhaps not at all. With so many computers on the market, software companies are hard-pressed to create specific versions of their products for each one, and will instead direct their energies toward the computers that are likely to sell the best. The competition within the industry to gain the cooperation of software developers for doing machine-specific versions of their products is intense.

The variance in software availability between different machines makes the selection process more difficult when you shop for a computer, but it can also help to guarantee that the companies selling computers are serious about it. After all, if you're a hardware company trying to con-

vince software developers to do versions of their products for your machine, the chances are you'll want to develop solid marketing and distribution plans to impress them with.

Ken Scott is the president of POLO Microsystems (Mountain View, Calif.), makers of a new MS-DOS computer. The POLO unit uses a high-resolution screen that begs for the kind of software that has to go around MS-DOS, and Scott acknowledges the competition for support from software developers, but feels there's still room for new products that add value. "It's true," he says, "we've had some companies say, 'POLO who?' but generally, we've had a very good response. We're able to show software developers that we have the infrastructure—the manufacturing, distribution, and marketing—to become a successful factor in the market. They want to know, can we do it . . . do we keep our commitment, do we have the ability to manufacture and distribute the kind of quantities we're projecting . . . and if we do, they'll support us."

As things stand today, the IBM/MS-DOS standard may not be the best of all possible things for any of us, and may have been obsolete soon after its introduction, but that may not matter very much. "At any given point in time," says Dr. Lawrence Lotito, vice-president of marketing at Corona Data Systems, makers of Personal Computer-compatibles, "whatever is most commonly used is already out of date. I think that's a natural phenomenon . . . that there's always going to be a new approach and a better, faster, more efficient product around. The point, though, is that people paying their money to buy this equipment are interested in doing a job, and the only question is whether it does the job or not, and whether it will be competitive for the next two or three years. Beyond that, they fully expect that there is going to be something else."

As the market becomes crowded with MS-DOS computers, more and more hardware manufacturers are striving to set their products apart from the herd. Hewlett-Packard's HP-150, for example, uses a touch-sensitive screen to simplify the user interface. Tandy's Model 2000 offers a faster processor. Appropriately, the reason for such differentiation among "standard" products can be spelled out with the same three letters that fueled the standardization in the first place . . . IBM.

One vice president of marketing has described this differentiation as staying a safe distance from the gorilla's cage, a thought echoed by George Morrow.

"It's like having an animal that takes a bite out of anybody who sticks his hand inside the cage," says George Morrow. "You have to assume, even if it doesn't do it the minute you stick your hand in, that, sooner or later, it's going to bite again."

The "bites" Morrow refers to are part of the history of the computer industry, which is littered with companies, some defunct, that have felt IBM's competitive teeth. Although the Armonk, New York-based giant thus far has been relatively benign in the personal-computer marketplace, history teaches us that whenever the marketplace has taken a significant percentage of business away with IBM-lookalike products that were cheaper, IBM has reacted, and not necessarily with lower prices. In IBM's mainframe business, when companies started undercutting the price of IBM's disk drives, IBM made a few proprietary enhancements to their disk controller while simultaneously moving that controller into the mainframe computer. The plug-compatible disk drive business was decimated, because their disk drives were no longer compatible. Similarly, in the early 70s IBM sales were being hurt by the sale of plug-compatible memory. After

*Next-generation microcomputers may just
be fast enough and have enough memory
so that the inefficiencies of UNIX won't matter.*

**SPECIAL REPORT**

much study of the problem by IBM task forces, IBM released a new version of its 370 mainframe that moved memory from its former location in a separate box to reside in the mainframe itself, a move IBM said improved performance and reliability. It also evaporated the market for plug-compatible memory, however, and testimony during IBM's antitrust trial revealed that this may have been the real reason for the move. Among the evidence presented to that effect was the new 370's codename: SMASH. An IBM executive testified rather weakly at the trial that the idea of smashing competition was not the source of the name, rather that it had come from his suggestion to "put this whole smash, all these products, out at one time." That antitrust suit was dropped, however, and industry observers note that this dismissal may have loosened IBM's self-restraint in moving strongly against competition. On the mainframe systems level, for example, where a good deal of competition has come of late, IBM has managed to limit the success of such companies as Amdahl and National Advanced Systems with a series of product upgrades and a slew of lawsuits.

Indeed, IBM's current "open system" policy for the IBM Personal Computer goes against the company's entire past history, and it would be foolish not to think about the possibility of IBM returning to form. The personal-computing companies that have the most to fear from an IBM reaction, of course, are ones selling computers with little or no differentiation from the IBM Personal Computer. Even Corona Data Systems, which offers systems with higher-resolution graphics and a multiuser option to set itself apart, is nonetheless dependent on its price advantage over IBM and high degree of Personal Computer-compatibility. Larry Lotito acknowledges this makes them somewhat vulnerable, and says IBM could put them or al-

most any other company out of business quickly if it desired. But he doubts they will, and engages in a favorite computer-industry pastime, speculating on what IBM is planning to do. Industry executives seem to spend a great deal of time worrying about it.

"If I were IBM, I wouldn't be building game plans to take all of the $8 billion business in personal computers predicted for 1986, because if it turns out to be only $6 billion, I would be $2 billion short and hurting," he explains. "But if I aimed for only 50 percent of the predicted $8 billion and the market turned out to be only $6 billion, I could still get the $4 billion I expected by taking it out of the hides of the other guys, because I'm IBM."

Competing with IBM on the basis of running the PC-DOS software base and offering a price advantage may indeed be asking for trouble, but even companies with a certain degree of differentiation can be in for it if IBM perceives they are serious competition, according to Lotito. When Texas Instruments released its Professional Computer—an MS-DOS machine that offered an internal hard disk option and lower pricing—for example, IBM was quick to counter with price cuts and the hard disk-based XT, even though the TI machine was not designed to be an IBM clone. One can only speculate on what strategy IBM would adopt if a huge competitor—ATT, for example—challenged IBM directly, or if the large number of Personal Computer clones succeed in capturing and holding a significant portion of the market once IBM has increased its production capacity enough to fill demand. IBM might well react by changing the standard operating system. Now, this is sheer speculation, but it makes a point, so bear with us.

Morrow predicts IBM will stick with MS-DOS until they feel the time is right to bring more software

revenues in-house by introducing an operating system enhancement for the Personal Computer that gives its own developers an advantage, and "leaves Microsoft and MS-DOS dangling in the wind." Lotito agrees that such an action is possible, and suggests that the proprietary portion of the new operating system might link the Personal Computer to a simultaneously announced Local Area Network product that also ties to the large installed base of IBM mainframe computers.

More weight is given to the argument by Apple's chairman, Steve Jobs, who scoffs at the risk Apple is taking with the non-IBM-compatible Macintosh. "The guys taking a chance are the ones tying their future to IBM," Jobs says. Software companies writing PC-DOS software depend on IBM's current desire to have other companies write and distribute software for them, but Jobs argues that it's only a matter of time before Big Blue will want to take it all. The hardware people making Personal Computer clones are especially vulnerable, he argues, because "IBM is going to come out with a proprietary version of PC-DOS that other companies won't be able to buy from Microsoft."
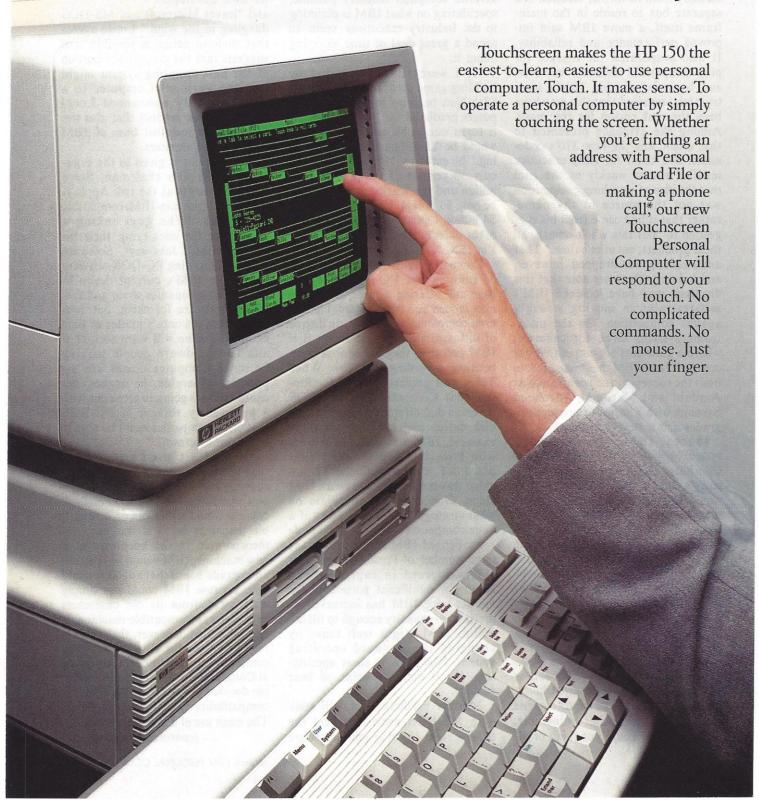
Microsoft's Chris Larson argues that IBM could not accomplish any shutting out of the competition with a new operating system, however, because it would either run on compatible machines or, if it was partially incorporated in the hardware of a new machine, IBM would have to sell an upgrade board that anybody could buy, because IBM could not simply walk away from its old customers with a new, incompatible machine. It can be argued, however, that there is really no need for IBM to maintain compatibility with its current Personal Computer, for the same reason Apple decided to dispense with Apple II compatibility in its latest products. The main use of a personal computer,

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| Diagnostics: | Power-on self testing |
| Display Screen: | Touch-activated, green phosphor |
| | 80 characters x 27 lines |
| | 9 x 14 character matrix |
| | Upper and lower case |
| | Simultaneous text and graphics capability |
| | 390v x 512h graphics resolution |
| | 1024 characters and symbols in ROM |
| Keyboard: | 107 keys, 8-ft. cord attaches to system unit, 10-key numeric pad, 12 function keys (8 screen labeled) |
| Compact Size: | 2.1 sq. ft. desk space |
| Communications: | 2 RS-232 ports (Built-in) |
| | HP-IB (IEEE-488) (Built-in) |
| | IBM 3278 (SDLC, BSC), early 1984 |
| | Up to 19,200 bits per second |
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**HEWLETT PACKARD**

# Keeping Corporate Computers Personal

The big productivity gain is only possible when the "personal"
remains an integral part of the computing process

*by David Gabel, Senior Editor*

The word is out: There's a revolution going on in corporate America. It's called personal computing, and if you aren't already a part of it, the chances are very good that you will be, soon.

Almost overnight, it seems, personal computers have found themselves on desk tops in offices from New York to San Diego. Managers have added words to their vocabulary—terms like spreadsheet, data base, modem, RS-232, and graphics package. Even the skin magazines which used to lure weary commuters to the newsstands in New York's Pennsylvania Station have been replaced with less lurid, but more interesting computer titles. Everyone, it seems, knows about, or uses, or knows someone else who uses, computers.

As the revolution gathers momentum, the corporations have decided that, like any organization confronted with revolutionary change, they have three options: They could attempt to stop it, they could ignore it, or they could accommodate.

Some tried to stop it, and by and large couldn't. The pressure was too great. Others figured the personal-

computing "fad" would fade out with the rest of them, and so chose to ignore it. It didn't, and such companies found the revolution producing somewhat chaotic conditions as revolutions, unchecked, are wont to do. Other companies tried to encourage personal computing inside their organizations, seeing it as a way to make the company run better.
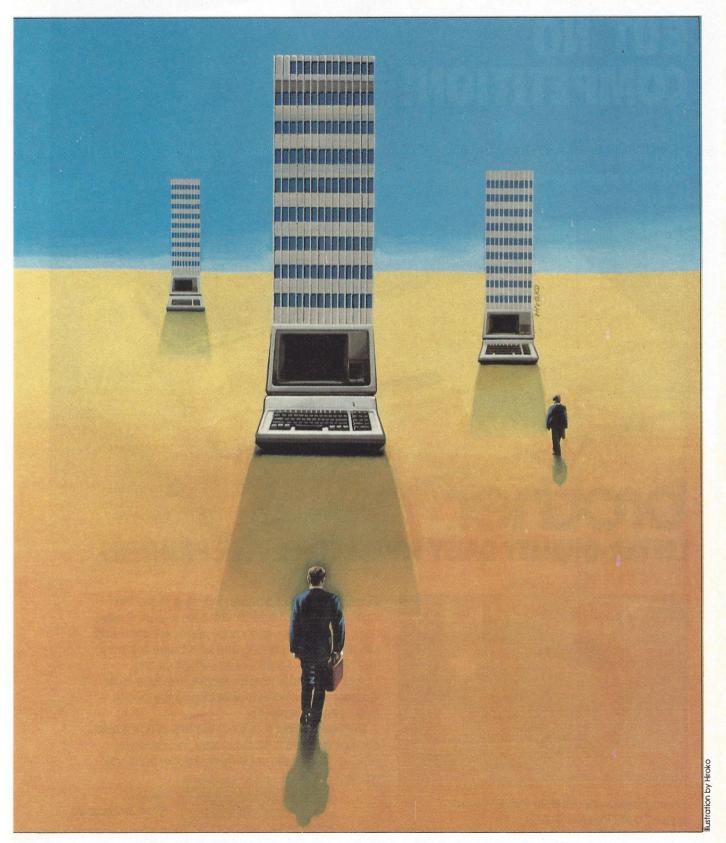
Now, those same companies that espoused the first two approaches are moving into the third approach, jumping on the personal-computing bandwagon in one way or another. For the managers of those companies, that "jump" presents them with a whole new set of circumstances. Now, instead of three attitudes, the company has adopted only one.

In the past, if the company discouraged personal computing, people got computers, peripherals, and software by euphemistically calling the whole shooting match "office equipment." If the company encouraged computing, help was available. In those companies ignoring computing, people pretty much did what they wanted, and hoped no one asked too many questions. But that's changing.

Now companies all over America are setting up what can be called resource centers for personal computing. The purposes of these centers are, ostensibly, to bring some sense into the personal-computing situation in the company; to help both present and prospective users of the machines get into the swing of it, and help more advanced users develop applications for the use of personal computers. In many cases, the resource centers also review requests for personal-computer purchases and approve such expenditures.

How is the manager to deal with this new corporate phenomenon? Even more important, how can he ensure that computing within his department meets his needs, the needs of his people, and the needs of the company, as well? In short, can you keep the personal in personal computing in light of the new interest of *executives* in those small computers?

Sure you can. But you have to realize that you're not going to have a free hand anymore, if you ever had one. You'll have to work within the guidelines that your company sets up, which really isn't as negative as it

Illustration by Hiroko

sounds, since those guidelines are becoming more and more people-oriented, and less company-oriented. (Or is it that the companies themselves are becoming more people-oriented?)

No matter. The good news in this whole situation is that you'll probably find someone in your company whose responsibility it is to help you get started—or get better—in computing. By and large, these people have enough computer expertise so that more than just talking about help, they can provide it. The bad news is they may not see things the way you do, or corporate constraints could throw roadblocks in your path, or you might not even speak the same language.

"Companies often use the resources of the MIS (Management Information Systems) Department," says Marty Butler, president of the Microcomputer Managers Association in Boston. "It's often someone with a title like VP of office automation or VP of information systems. They're set up to handle inquiries from inside the company about personal computers. And they often do it by setting up small-computer centers in the firm where people can come to see demonstrations of various computers and leading software packages. Computers might include IBM Personal Computers, Apples, Digital Equipment machines, and Wang personal computers. The software is stuff like spreadsheets—VisiCalc and the more advanced products."

"The centers are staffed with knowledgeable people who can answer questions others in the company have, and can respond to their needs. Of course," Butler continues, "some companies don't have the centers. Instead, they have consultants who can help people define their needs for computing, review their requests for hardware and software, and help them with their computing applications."

Butler's Microcomputer Managers

*How is the manager to deal with the phenomenon of personal computers in the corporation?*

Association was started to provide a way for the people involved with and managing personal computing to meet and discuss common problems. "We have quite a few members from large Boston corporations," he says. "We hold monthly meetings where we discuss topics of interest to managers about personal computers." Membership isn't restricted, though, to computer professionals. MMA is also seeking people who are line managers, and who want to make the most of computing in their work, and in their employees' work. "The whole purpose," he says, "is to keep people from reinventing the wheel. If someone has a problem, he can come to a meeting and bring it up. You'd be surprised how many people have faced exactly the same situation and have solutions. If someone has already dealt with the problem, why solve it all over again?"

The business of bringing computers into corporations is indeed often a question of solving problems that have already been solved, because companies find themselves in all phases of personal-computer implementation. For instance, Laventhol & Horwath is a Philadelphia-based accounting firm that has been encouraging the use of personal computers in its offices for about five years, thanks largely to the efforts of

Alan Sneider, a senior partner. Sneider, who works in the firm's Boston office, had the only computer in the company when he brought his Apple in and put it on his desk in 1979. Since then, that situation has changed dramatically, and now "about 75 percent of the people in the firm are using personal computers. Not all the time—not eight hours a day—but they are using them," says Sneider.

On the other end of the spectrum is Stevens Corporation, an investment-banking firm with headquarters in Little Rock, Arkansas. This company has set up an information center equipped with two IBM Personal Computers and an XT model, along with a CPT word processor and two Compaq computers. There's also phone-dictation equipment located in the information center, and the center is staffed with trained operators. "A person can go in there," says Ray Gash, corporate controller, "and describe what he wants done, and the essentially clerical people do the actual work."

Gash says the Compaq computers are there for people who want to do some work on a personal computer themselves. "They can take the portable computers back to their own area as they develop the skills to use them." Gash adds that the company is helping people develop those skills by working with them individually and in classes. And it is also sending employees to local training classes on packages like Lotus 1-2-3. "We're trying to keep up with the hardware and software," he says. If someone in the company can justify purchasing a personal computer, then the company could get it for him.

Clearly this is a company that is just beginning to come to grips with the personal-computing revolution. It is modeling its use of small computers on its past experience with an outside service bureau, to which Stevens connected remote terminals. Such terminals are almost never used for per-

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| 3 DATE | Time between dates |
| 4 DAYYEAR | Day of year a particular date falls on |
| 5 LEASEINT | Interest rate on lease |
| 6 BREAKEVN | Breakeven analysis |
| 7 DEPRSL | Straightline depreciation |
| 8 DEPRSY | Sum of the digits depreciation |
| 9 DEPRDB | Declining balance depreciation |
| 10 DEPRDDB | Double declining balance depreciation |
| 11 TAXDEP | Cash flow vs. depreciation tables |
| 12 CHECK2 | Prints NEBS checks along with daily register |
| 13 CHECKBK1 | Checkbook maintenance program |
| 14 MORTGAGE/A | Mortgage amortization table |
| 15 MULTMON | Computes time needed for money to double, triple, etc. |
| 16 SALVAGE | Determines salvage value of an investment |
| 17 RRVARIN | Rate of return on investment with variable inflows |
| 18 RRCONST | Rate of return on investment with constant inflows |
| 19 EFFECT | Effective interest rate of a loan |
| 20 FVAL | Future value of an investment (compound interest) |
| 21 PVAL | Present value of a future amount |
| 22 LOANPAY | Amount of payment on a loan |
| 23 REGWITH | Equal withdrawals from investment to leave 0 over |
| 24 SIMPDISK | Simple discount analysis |
| 25 DATEVAL | Equivalent & nonequivalent dated values for oblig. |
| 26 ANNUDEF | Present value of deferred annuities |
| 27 MARKUP | % Markup analysis for items |
| 28 SINKFUND | Sinking fund amortization program |
| 29 BONDVAL | Value of a bond |
| 30 DEPLETE | Depletion analysis |
| 31 BLACKSH | Black Scholes options analysis |
| 32 STOCVAL1 | Expected return on stock via discounts dividends |
| 33 WARVAL | Value of a warrant |
| 34 BONDVAL2 | Value of a bond |
| 35 EPSEST | Estimate of future earnings per share for company |
| 36 BETAALPH | Computes alpha and beta variables for stock |
| 37 SHARPE1 | Portfolio selection model-i.e. what stocks to hold |
| 38 OPTWRITE | Option writing computations |
| 39 RTVAL | Value of a right |
| 40 EXPVAL | Expected value analysis |
| 41 BAYES | Bayesian decisions |
| 42 VALPRINF | Value of perfect information |
| 43 VALADINF | Value of additional information |
| 44 UTILITY | Derives utility function |
| 45 SIMPLEX | Linear programming solution by simplex method |
| 46 TRANS | Transportation method for linear programming |
| 47 EOQ | Economic order quantity inventory model |
| 48 QUEUE1 | Single server queueing (waiting line) model |
| 49 CVP | Cost-volume-profit analysis |
| 50 CONDPROF | Conditional profit tables |
| 51 OPTLOSS | Opportunity loss tables |
| 52 FQUOQ | Fixed quantity economic order quantity model |
| 53 FQEOWSH | As above but with shortages permitted |
| 54 FQEOQPB | As above but with quantity price breaks |
| 55 QUEUECB | Cost-benefit waiting line analysis |
| 56 NCFANAL | Net cash-flow analysis for simple investment |
| 57 PROFIND | Profitability index of a project |
| 58 CAP1 | Cap. Asset Pr. Model analysis of project |
| 59 WACC | Weighted average cost of capital |
| 60 COMPBAL | True rate on loan with compensating bal. required |
| 61 DISCBAL | True rate on discounted loan |
| 62 MERGANAL | Merger analysis computations |
| 63 FINRAT | Financial ratios for a firm |
| 64 NPV | Net present value of project |
| 65 PRINDLAS | Laspeyres price index |
| 66 PRINDPA | Paasche price index |
| 67 SEASIND | Constructs seasonal quantity indices for company |
| 68 TIMETR | Time series analysis linear trend |
| 69 TIMEMOV | Time series analysis moving average trend |
| 70 FUPRINF | Future price estimation with inflation |
| 71 MAILPAC | Mailing list system |
| 72 LETWRT | Letter writing system-links with MAILPAC |
| 73 SORT3 | Sorts list of names |
| 74 LABEL1 | Shipping label maker |
| 75 LABEL2 | Name label maker |
| 76 BUSBUD | DOME business bookkeeping system |
| 77 TIMECLCK | Computes weeks total hours from timeclock info. |
| 78 ACCTPAY | In memory accounts payable system-storage permitted |
| 79 INVOICE | Generate invoice on screen and print on printer |
| 80 INVENT2 | In memory inventory control system |
| 81 TELDIR | Computerized telephone directory |
| 82 TIMUSAN | Time use analysis |
| 83 ASSIGN | Use of assignment algorithm for optimal job assign. |
| 84 ACCTREC | In memory accounts receivable system-storage ok |
| 85 TERMSPAY | Compares 3 methods of repayment of loans |
| 86 PAYNET | Computes gross pay required for given net |
| 87 SELLPR | Computes selling price for given after tax amount |
| 88 ARBCOMP | Arbitrage computations |
| 89 DEPRSF | Sinking fund depreciation |
| 90 UPSZONE | Finds UPS zones from zip code |
| 91 ENVELOPE | Types envelope including return address |
| 92 AUTOEXP | Automobile expense analysis |
| 93 INSFILE | Insurance policy file |
| 94 PAYROLL2 | In memory payroll system |
| 95 DILANAL | Dilution analysis |
| 96 LOANAFFD | Loan amount a borrower can afford |
| 97 RENTPRCH | Purchase price for rental property |
| 98 SALELEAS | Sale-leaseback analysis |
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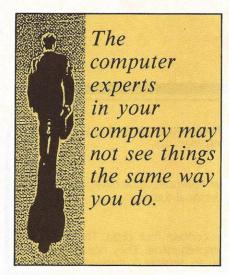
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CIRCLE 126

*The computer experts in your company may not see things the same way you do.*

*DP people will have concerns about efficiency, data security, and hardware and software compatibility.*

sonal computing as we have come to understand the term; they're employed in data-processing activities. And that's the way the computers in the information center are used, also. Essentially they are used to recast reports into specialized formats for audit purposes.

Whether your company is in the beginnings of its dealings with personal computers or it's fairly well along the path, the central question still remains: How do you deal with this corporate resource that's now at your disposal?

You can actually break this question down into two distinct phases. First, you have to understand what the information-resource people think about personal computers, on both the positive and negative side. Then you have to understand what personal computers can and should do, and what they can't and shouldn't do.

Information-resource personnel frequently come out of the old data-processing school, and their concerns reflect that experience. They will have concerns about efficient utilization of resources, about data-file security, about proliferation of different kinds of hardware and software, and about data compatibility from one system to another.

The information resource within a company will respond to these con-

cerns in different ways, depending on the firm's past history. Some firms don't see any problems in some or all of these concerns; others see problems lurking behind every keyboard.

But the bottom line is this: Resource utilization is the same thing, no matter what resource you're talking about. When you put some money into a tool, you want to be sure the tool will be used effectively and often enough that your investment will be paid back. You also want to be sure the tool will be used for its proper purpose. With computers, this question often boils down to some difficult decisions: Who should have a computer all the time? Who should share with others? Who shouldn't have one at all?

"We've just added five more machines here," says Laventhol & Horwath's Sneider. "A central question we're facing now is how many people should have a computer full time, and how many should share them. It's a problem of allocation that didn't exist a year ago, but the demand for the computers continues to increase."

Sneider, who is an accountant, not a data-processing expert, points out that the purchase price of an individual computer isn't great in and of itself, but add a number of them together and you've got a significant investment. Thus allocation and efficient use are becoming important.

But besides the economic factors to consider in allocating the computers, information-resource people are also taking into consideration the concern for data-file security—which means, quite simply, that there are files located within every corporation that shouldn't be open to common view. Then there are those that should be accessed by certain people, but not others, and only some of those persons should be allowed to alter the contents of the files. When everything's locked up in a filing cabinet, people feel relatively secure about their data. But when information is sitting on a computer disk file—and

we all know computers can be infiltrated—people get nervous.

Add to that the fear some people have that a 230k-byte floppy disk will be carried out of the office in a coat pocket, and you can understand concerns about data security.

Data-file security can cause some people to lose a lot of sleep. According to Ray Molinaro, manager of professional computing resources for Gillette Corporation in Boston, "Security is certainly an issue, and we're addressing it as an issue. We are in the process of posting security instructions near all computer equipment, including personal computers." Molinaro says Gillette has a tradition of giving individuals access to computing resources—access previously delivered through a time-sharing network. "We see the personal computers as an extension of our computing self-sufficiency," says Molinaro.

Reams have been written about the problem of data-file security. Gerald Ward, of Price Waterhouse, specifically addresses this issue in his pamphlet, *Microcomputers, Their Use and Misuse in Organizations,* available from Price Waterhouse. He talks about the disappearing floppy disk—the disk with sensitive company information on it that just *happened* to find its way into a coat pocket heading out the door. Mo-

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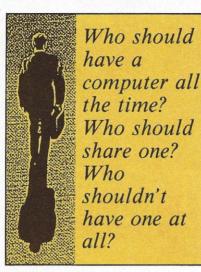
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CIRCLE 108

linaro says a guy could just as easily walk out the door with a computer printout, but others counter that a disk is a lot smaller than a printout. Security is a concern; there's no doubt about it.

In addition to the problem of data-file security, however, many corporations are concerned about two things of prime importance to any business: money and time. The proliferation of different hardware and software available brings a variety of associated costs. There are different kinds of peripherals needed for different computers, not to mention different software packages. All these things can add to the cost, so it's naturally a concern. Often, volume purchases can be negotiated, reducing piece cost significantly. But more important is the time it takes to get a person working on more than one kind of computer system. After you've got people used to a particular computer, they'll need time to get used to another one. The time will vary with the complexity of the computer and, more important, with the complexity of the software. It's just plain easier to work on equipment and programs with which you're familiar, and even that takes time. To combat this problem, companies strive for some form of standardization in both hardware and software.

"I've been asked to be a member of a national committee (within Laventhol & Horwath) called the information-systems and data-processing coordinating group," says Sneider. "I've suggested the firm standardize to some degree on IBM Personal Computers and compatible machines." He points out that standardization helps effectiveness and efficiency inside the company. People new to computing are now being trained on Lotus 1-2-3. So now a body of people know that particular program and they have applications running under it. "If someone is using, say, SuperCalc, and has to work with another person whose data is all

*Who should have a computer all the time? Who should share one? Who shouldn't have one at all?*

under 1-2-3, then there are obviously problems."

That leads directly to the problem of software standardization. "It's a ticklish problem," he says, "because we don't want to restrict people's initiative and say we're not open to new programs. But something has to be done to standardize the software, or else we're going to lose efficiency."

After all the hardware, software, and peripherals have been standardized, after all the data-files are secured, after all the costs have been checked and productivity-increasing explored, the company is faced with the final problem: data compatibility. Again, volumes have been written about this problem, and there are solutions to it, but unfortunately most of them are not obvious.

The concern is that you can't take a disk from an IBM Personal Computer and put it into an Apple and make the Apple read it, and vice versa, without some heroic efforts. It's a legitimate concern. Some people in the personal-computer industry, notably Microcom, a Boston-based data-communications hardware and software company, are trying to provide simple solutions through standard communications protocols and data formats. Microcom has enlisted the support of a number of hardware and software companies for what it

calls its networking protocols, but whether everyone will support them or not remains to be seen.
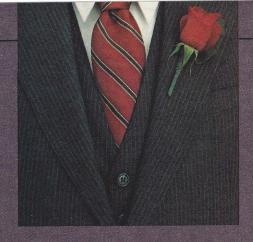
If those are concerns of the central information resource, line managers have a lot of concerns, too. They're principally concerned with getting their job done the best way they know how, in harmony with corporate objectives.

As far as personal computing is concerned, the corporation's objectives will be formed wholly or in part by the corporate personal-computing resource, whatever its name. If that group's ideas mesh with yours, then all is rosy. But there may be a conflict. Or the worst might happen: There may not be a common meeting ground at all, despite the fact that the mission of the corporate group is to help with computing.

"It's similar to any use of a central resource by a manager," says Cal Pava, a professor at the Harvard Business School. "There's often a conflict between the need to centralize and be economically rational, and the manager's needs to get things done."

Pava teaches courses about organizational behavior, the way people operate inside organizations, and what makes organizations tick. He has just written a book on the very thorny question of *Managing New Office Technology*, published by The Free Press, a subsidiary of Macmillan Publishing Company. "My concerns are very general," he says. "I work in the field of organizational structures."

Personal computing in organizations is so new that relatively little work has been done on the subject. As a result, much of what can be said about the area comes about from people's subjective feelings about it, not from objective research into the actual phenomenon. So, it's not surprising that people disagree to some extent about how to deal with that part of large organizations that is supposed to help get computing going.

*Know what
you want
your
company's
personal
computer
resource to
do for you
before you
start.*

*Make contact
with people
in the
corporate
computing
resource. Tell
them your
goals, needs,
and
expectations.*

Marty Butler, for example, president of the MMA, says managers should get really involved. "Educate yourself," he says. "Go to your company's information center, and talk. And learn. Go to the people who supposedly know what's going on. Join associations like the MMA, because we talk about issues like that. (MMA has chapters in New York and Boston, and they're forming in Detroit and Southern California.) Supplement that with reading publications and books—get really involved. That way, you'll know what's best, and you can get it pushed through.

"Go in-house to the micro managers," he continues, "and ask things like, 'Well, where can I see a DEC?' Impress upon whomever the need for your thing."

That approach will certainly surprise experts in the company, many of whom are, as we said, from the old DP school and still might regard themselves as custodians of the computer rituals. This attitude seems to be changing quickly, by the way. As Molinaro from Gillette says, "We in the MIS department haven't hindered the spread of personal computing at all. In fact, in some cases we have helped with applications analyses and recommendations for the purchase of a personal computer."

But there is a drawback to learning everything you can: "It takes a lot of time," Butler admits. "That's why so many companies are setting up the centers. In lieu of them, you're on your own."

Pava offers another thought. "You could argue," he says, "that the manager should remain ignorant of the technology; that he should approach the central resource people and state his problem, expecting them to deliver a solution. The central resource people would say he should learn the technology, but that, of course, makes their job a lot easier."

You could argue either way, and, obviously, people do. What most of us, confronted with new technology with which we're ill-prepared to cope, will do, probably, is negotiate results with the corporate staff. "Negotiations with computer people are often difficult, because their mind set is often in the computer administration area," Pava cautions. "They think in terms of missions of CPU cycles per second and stuff like that." But there are certain things he thinks managers can do, and probably should do.

"Clarify your expectations up front," he continues. In other words, know what you can expect your company's personal-computer resources to do for you *before* you start expecting them to solve all your problems with a sweeping wave of the hand. "Then you should have a fairly crisp idea of what a successful outcome of your project would entail. You might want to start using a computer, for example, to get your quarterly reports out sooner. That would be a successful outcome, and that's a goal that you can get people helping you on.

"Be prepared, by the way, to modify your definition of a successful outcome. You might find that your reports still don't get out sooner, but they're better than ever before, because you now do a more detailed job in the same amount of time."

Finally, Pava says, "Establish a solid liaison with a guy or a set of guys in the information resource." That way, he reasons, you have some point of contact within this particular corporate resource—someone who can understand your point of view, your goals, and your expectations.

What if all this doesn't result in what Pava calls, "a favorable outcome?" What if, for whatever reason, your corporate personal-computing resource just doesn't see things your way. Then what?

"You've got two choices then," says Pava. "You can wait, or you can go guerilla. Lots of managers temporize rather than saying no." He continues, "The other option, well, that's the way this whole thing (this personal-computing revolution) got started in the first place. Guys went underground to get what they wanted."

In a perfect corporate world, all our wants would be satisfied because they would be utterly defensible in their essential rightness, and there would be no annoying constraints imposed upon us. In the corporate world as it is, things are always shaded a little bit one way or the other, and there are always constraints that we may not want to deal with. There are corporate politicians, too, jealous of their territory and fearful of potential loss of that territory. This seems to be

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changing, at least according to Butler, who maintains, "There are some turf questions, and in a couple of cases that was the problem. But there's no stopping personal computers, and most companies realize that. They have decided they'd better get a handle on them."
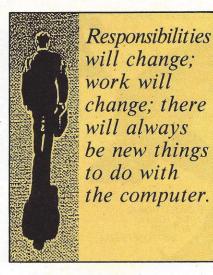
So, dealing with your corporate personal-computing resource these days is likely to be like dealing with any other central service activity in the company. There will be tensions, but they can be resolved, in most cases, by negotiation. If not, then you still have, as Pava says, the option to "go guerilla."

There's another question that's much more interesting than how well you get along with the resource center, though, and that's the way you use computing in your own area of interest. Or, to get even more basic, the way in which you intend to use the computers in the first place.

It's one thing to learn the technology of computers, if you're into that, or to establish a good working relationship with a corporate entity designed to help you use computing. It's quite another to understand what will happen to your people and your own organization when computing becomes a part of it. That, according to Pava, is where the real challenge lies.

"The fantasy," he says, "is the myth of technology. You just plug in the computer and it works, and your problems are solved. The fact is that computers unfreeze a host of organizational factors, and after that happens it's tough to sort them out.

"Most companies," he maintains, "install computers by default, not by design. And then what happens? If you have a raft of personal computers installed, and the company is one with a lot of internal competition, then the company gets more competitive, but not smarter. Instead of having one presentation per department at budget time, you'll have seven, and each one has more color in the graphics than the next. But it

*Responsibilities will change; work will change; there will always be new things to do with the computer.*

doesn't accomplish anything—it's all one-upmanship. If, on the other hand, it's a company that has a lot of consensus, then the company gets smarter."

Pava maintains strongly that managers have to understand what they hope to improve by installing personal computers. Usually they focus on some narrow product, like the quarterly reports. But the unfreezing of the organizational factors that he talks about will set in. "The metaphor of a computer as a bicycle for the mind is incomplete," he says, "because it doesn't take the changes in your thinking into account." Bicycles don't change the basic nature of feet, he notes, but computers have the potential of changing the thinking of their users. "It's a multipurpose device," he says, "but you don't know what you can do with it until someone starts to tinker." In other words, human initiative will take over, and then people will begin to develop new ways of doing things. "I know of clerical people who were assigned to workstations for word processing," he says, "and they went into the data-management system, studied the manuals, and started using that system to help the boss get his work done. No one ever expected them to be able to do that."

So work will change, responsibili-

ties will change, and there will always be something else that people think about to do with a computer. And the department manager could find himself in a constant rejustification fight.

"That could be," says Pava, "but it depends on the relationship. And it is in the central personal-computing group's interest, after all, to encourage new things."

Anyone responsible for an organization is likely to feel uncomfortable as the organizational factors begin to thaw. And if, as Pava claims, computers start that unfreezing, then the smart players will try to be prepared for it. It can be a delicate situation.

You have some resources to help, and your company is providing them. They're there to help you get a handle on personal computing, to maintain economic rationality in the face of the computing revolution. They can help with the hardware and the software, but they probably won't be any help at all with your own organizational impact. You'll probably have to go that alone, using your own instincts and gut feel.

Arielle Emmett, a contributing editor to *Personal Computing*, said, in our September issue, "There is a new set of social contracts to be worked out in the corporation these days: Managers must determine, as the French utopian philosopher Rousseau once did, how to divide up territories, maintain the integrity of the individual, work superbly for the common good, and cope with the coming forces of Revolution." The revolution is now—everyone, it seems, uses, or knows about, or knows someone else who uses, a personal computer. We're all a part of it, and it is we—with our instincts and gut reactions—who will shape it. We're the people who will hammer out those new social contracts, right within our companies, using whatever corporate resources we can bring to bear on the problem.

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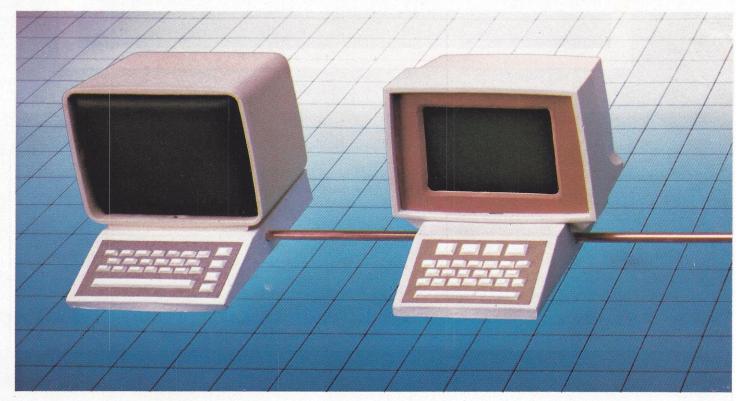
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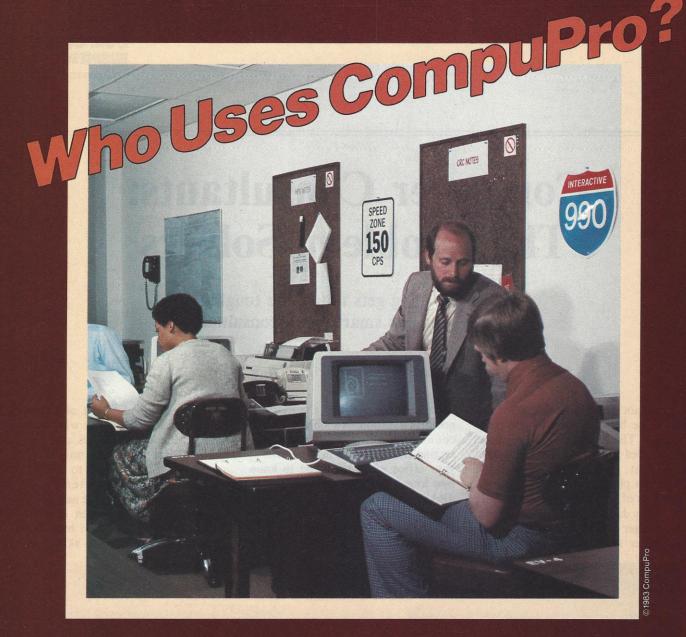
**A**sk not for whom the bell tolls. The bell tolls for the computer hacker. The number of his days has descended below zero. He is a relic of the past, an artifact, a walking museum piece who serves only to remind us of how far we've come since the early days of personal computing. No longer is he to be found in the computer store, ready to burn your ears for three hours at the most innocuous question. No longer can you count on finding him busily dissecting circuit boards in the corner of your office when you need to know how to get VisiCalc to fine tune your dBASE II files.

The hacker is gone. Driven to near extinction not through any particular fault of his own, but by the overwhelming multiplication of a new breed: the computer user who cares nothing about data busses and data bits and data types, but only about applying a finished tool to his job. Meanwhile, as computer stores spread across the land, the number of hacker/salesmen has been dwarfed by that of gentlemen who have previously proven their sales skills with

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products ranging from neoprene shoes to offshore oil leases, but who know less about the computers and software they're now selling than the average 14-year-old.

Which, unfortunately, causes a bit of a problem. That is, if the hacker has been replaced in the computer marketplace by a consumer far more interested in the ends than the means of computing, while at the same time he's been replaced in the computer store by salesmen who reply "Your guess is as good as mine" when you ask, "What happens if I press this key?" then where are today's demanding new consumers to find the finished, surprise-free, complete systems they want?
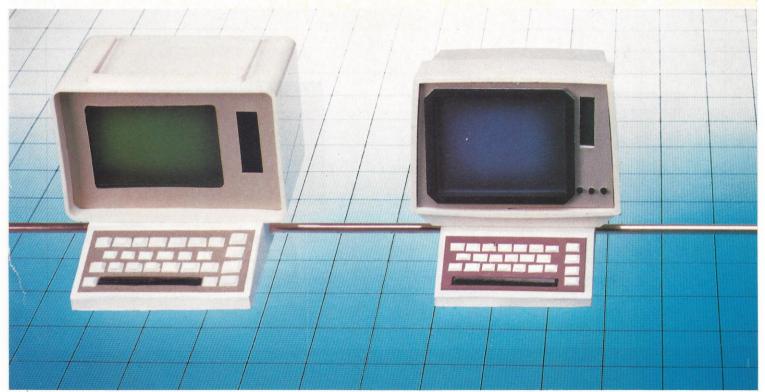
We're talking turnkey here. Systems for smart businessmen who don't want to hear any talk about how the average person can learn to use this fantastic data-base system in less than a year's time. Systems that work the minute you drop them (gently) onto your desk. Finished products, as

it were. Where can they be found?

The answer, at least for companies or organizations with sufficient resources, is a computer consultant. Consultants don't come cheap ($100 per hour is a fairly common figure, and most don't want to bother billing for just one hour), and they readily admit that in most cases they don't do anything that you couldn't do yourself. As Frank Woosley, manager of the management advisors services department in Little Rock, Ark., for Deloitte, Haskins & Sells, says, "Personal computers are designed to be do-it-yourself. If someone is an enthusiast and is interested in those things and willing to devote the time to it, they don't need us, except maybe on the front end to keep from buying something that's inadequate, or from spending too much. But most of the people we advise aren't computer enthusiasts. They're doctors, and doctors like being doctors, or retailers, who like selling stuff. These people don't necessarily like com-

puters. Even though they're easy to use, computers aren't like eating ice cream. It's not something you do for fun unless you're enthusiastic about it. We work for people who would rather do what they do for a living and pay us than sit there and learn how to do it themselves."

The point is, if you are willing to spend the time researching, troubleshooting, and banging your head against the wall that it would take to set up the computer system you need, then you don't need a consultant. The consultant's job is to save you that time, and to give you a system that works the way you want it to in less time and with fewer headaches than could you or your data-processing department.

The advantages of calling in a consultant in certain situations are clear. Only a fool would try to set up a local area network of 50 or 100 computers without some professional advice. But in other cases, the need for a consultant is less obvious. So when

should you call in a consultant? And how do you make sure the one you hire can do the job you need done? And finally, once your system is installed, how do you make sure that you don't continue helping him make his payments on his condo in the Bahamas every month by making him as regular a fixture around your office as the copier repairman?

### The windows of vulnerability

The first part of the question—when do you need a consultant—really boils down to your vulnerability: How much is at stake and how much room is there for you to make a major error? James R. Hare, president of Computer Visions, Inc., a systems consulting firm located in Oakland, N.J., says, "If you're going to spend less than $10,000 for a system, or if you're going to bring in a computer to do one particular task, one specific function, then a consultant probably isn't warranted. You could probably do it on your own. But if you're going

to spend more, or if you plan to integrate your entire company, strategic planning is critical. Even if it's just a two-hour consultation where you say, 'Here's what I want to buy, what do you think?'
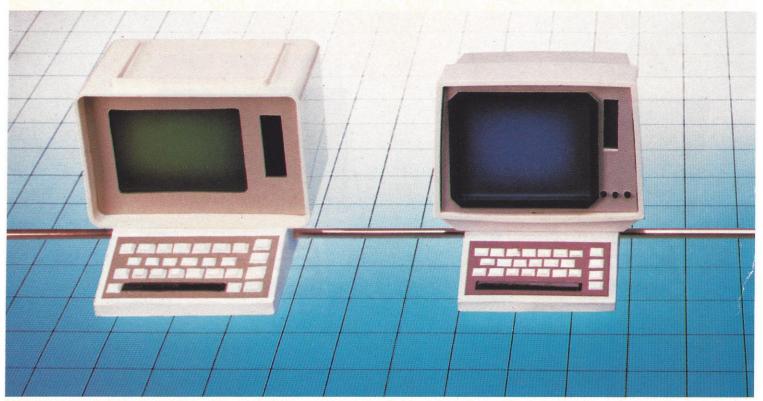
"I would say what really warrants the cost of a computer consultant is how much money you're going to spend on the project. If you're going to buy a home computer, obviously not," Hare says. "If you're going to buy an Apple II and a simple accounts receivable program, I would probably charge as much as the whole hardware and software package. I mean, I really don't go in for 100 bucks, it just isn't worth it. But if you're going to spend over 10 grand you better get some professional advice, because maybe I can save you 10 percent."

### What can he do?

A consultant can help you ensure that the system you buy is the system you need. The same, unfortunately, is not

always true of the salesman in your neighborhood computer store. Hare says, "I used to work in one of the large chain computer stores. There I would sell you what I had in stock. If I didn't have the best product for your solution, I wouldn't say, 'You should buy this type of software, but I don't sell it.' My best solution was whatever I had on the shelf. If I had something different the next day, then I would have a different best solution. So the problem with anyone who sells equipment—which I do not do now—is that their best solution is limited to what they sell, and most are limited to two or three products."

There's often more at stake when you computerize than the bottom line. Your time, for instance. Or the proper allocation of the money you're putting out. Or the health of your business. A consultant can help you safeguard each of these resources.

Actually, it's often difficult to separate those resources. As Pete Mackie, president of Seaquest Soft-

ware, Inc., a Portland, Oregon-based consulting firm, points out, "If a business manager or an entrepreneur starts spending six hours a day for five weeks on one of these machines to get it going he's probably letting the rest of his business fail. He's not managing it properly. He's probably already stretched thin, and he doesn't have the time to do that."
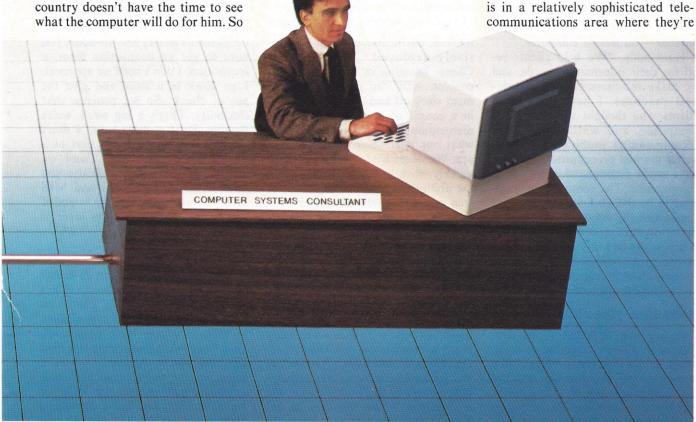
The result, according to Frank Woosley, is that the person who most needs the computer often doesn't use it because he doesn't have time to learn how. "Many times when you drop an IBM and a copy of dBASE II on someone's desk your investment gets misallocated. The guy in the mailroom really likes it so he sits there and uses the computer to write himself a big data base on how to deliver the mail, while the guy that's sitting over there trying to keep up with all the construction projects your company has going around the country doesn't have the time to see what the computer will do for him. So

you're taking your investment and giving it to someone who doesn't need it." Woosley adds that, "In that respect, we can look at what's going on in your entire organization and say, 'Here are your priorities, here are the people who really should be using these things, and if they don't have time to set up applications we'll do it for them.'"

Sensor-Based Systems (Chatfield, Maine) has a customer-support plan for its relational data-base, MetaFile, that appears to be unique in the degree to which they offer consulting services to their customers. In addition to offering five ready-to-run MetaFile applications (general ledger, payables, receivables, inventory, and payroll), they offer classes in MetaFile programming to their customers, and are prepared to write customized applications when the

customer is unable to do so. Jeffrey Karp, regional manager for the New York City area for Sensor-Based Systems, says, "The need for help depends on the client's level of expertise. If they have no exposure to programming logic and must have an application up and running under some tight time frame, then we recommend they get some assistance. MetaFile programming assumes that somebody knows what a WHILE, or an IF, THEN, ELSE loop does." Describing the kind of assistance that Sensor-Based Systems can provide, Karp says, "I just came out of a demonstration with the heads of a department for a large bank. They have to have the applications they want up and running in four weeks, and they want them totally user friendly, where somebody who has never used a computer can just sit down and turn it on and be taken through all the steps. The application is in a relatively sophisticated telecommunications area where they're

COMPUTER SYSTEMS CONSULTANT

pro-rating bills across departments. Now it would take their mainframe people eight months to program that, so that's not a solution. They don't have anyone in their department who knows micros or who could learn enough to really survive their audit trails and accounting functions in the four weeks they have, so they're in a bind. But we can do it for them in four weeks, in fact it won't take us more than a week to do, so for them it's worth it to spend the money and have us program the application. And they can use the application we build as a prototype for the four or five other applications they want."

While he's setting up your applications, a consultant might also be able to help you maximize their efficiency. James Hare notes, "The client gets both a consultant and an analyst. We look around, and ask that client, 'Why are you doing things this way?' He answers, 'Well, I don't want to but we've been doing it that way for 20 years.' I say, 'Well, now you don't have to—you have a computer.'"

Hare adds, "We help clients reaffirm their information needs, and we make recommendations on business practices. I have gone in to clients who thought they needed a computer, and walked out after recommending nothing more than better manual procedures. I actually have made recommendations not to computerize. The computer may appear to be the ultimate solution, but sometimes the solution may be just better manual procedures. You can't computerize bad procedures anyway, you've got to have good manual procedures first. Never do we program an inefficient operation."

### What about your DP people?

One question that has to be considered in a large corporate environment is whether the presence of a consultant will threaten the realm of the data-processing or management information services department. Not necessarily. In fact, most con-

sultants are ready and willing to work as an adjunct to your firm's data-processing department, providing that department with the expertise in personal computers that it may lack. Frank Woosley points out that, "We can help direct the efforts of the DP shop, help them figure out where to buy the stuff and how many of them they need, and we can provide formal courses by putting together a workbook and sitting there with 10 or 12 people to teach them how to use the equipment in a classroom setting . . . A sophisticated DP shop would want to have a consultant train their people."

### Timely help

James C. Cheng, vice-president of Automatic Data Processing, brought in Computer Visions, Inc. to help install a complex data base of ADP's national clients. He says, "We needed to get something done pretty quickly. I certainly did approach our data center, which has massive resources, but it also tends to be massively deployed." According to Cheng, bringing in Hare's firm has enabled ADP "to get the development work off and running smoothly in a couple of months, and get the momentum going so that we know what our next seven or eight steps are. We were able to get going rather quickly, with greater flexibility and the ability to change directions after step one and again after step two. Whereas, if you go with an internal data center you have to spend a lot more time thinking about exactly what you want to do beforehand." He stresses that "I don't necessarily see this as a weakness or a fault of the internal approach. Internally we are charged with doing different types of undertakings which are typically more amenable to predesign, pre-architecture, and firming-up before you proceed with the actual development program. But in this case it was a situation where we had to get going rather quickly and learn the

business of microcomputers at the same time, and modify our plans as we went along."

Cheng's comments, and those of Sensor-Based Systems's Karp, point out one of the prime reasons for bringing in a consultant: He can get the job done fast. James Hare notes that many of his clients are firms with MIS departments "who have the capability to do exactly what we're doing for them, but it would take them 18 months to two years to have it completed. We did one project like that in 15 days. We can provide things that no way—I don't care what you have in-house—can you do as fast as we can. I work 24 hours a day for two weeks. I don't know anyone's employees who will do that. If you have something that has to be done, like computerizing your budget in two weeks, an employee just can't do it. And he wouldn't have the resources to do it even if the company were behind him. He just couldn't mobilize things. If I need a hard disk for a client I go buy one. In-house you have to get an acquisition form, a requisition. I don't need an approval, I go down to a store and give the guy a check. So we provide that flexibility. That's a big word, we're flexible. So if a client says, 'I don't like the way you did this part of a program,' I say, 'Fine,' and we change it right away. In-house you have to go through MIS and MIS says why are you changing it and if you're lucky, two months later it might be changed."

### Finding a good man

A computer consultant can obviously do a lot for you. That is, he can if he's good. But that's the catch. There's no bar exam for computer consultants. In fact, as James Hare points out, "Anybody in the microcomputer field has two cards. Anybody who's a salesman also has a consulting card, anybody who works for IBM or Xerox or DEC also has a consulting card in his pocket. It's easy to call

**“In the long run you have to
develop the expertise within
your own organization. ”**

yourself a computer consultant. It costs you $32 to get some cards printed.”

The consequences of hiring an incompetent consultant can be disastrous. One of the consultants to whom we spoke, who asked not to be identified for fear of embarrassing his client, described what can happen: “Tomorrow I'm going to visit some people who've got $100,000 worth of hardware and $230,000 worth of software and it doesn't work. It's a minicomputer system, but the same thing could happen with personal computers. They're asking me if they should just bag the system. They had three different companies involved, one that supplied the hardware, one that designed the software, and one that wrote the system, and they were all supposedly professionals, but the system just doesn't work.”

So, how do you ensure that the consultant you hire to do a massive, complex data-base system isn't a charlatan who only knows how to program in PET BASIC? Pete Mackie suggests “You should talk to two or three consultants or firms (about what they propose to do for you) before you hire one. If, for instance, you're going to have custom software done, one person may like the P-System, one may like MS-DOS, another may like UNIX. If the poor layman who's going to purchase something goes to a UNIX lover he's going to get a UNIX system when maybe he should have had MS-DOS. You get what the consultant happens to like.”

Hare adds, “I would ask the consultant what he can do, what he knows. References aren't a bad idea, especially similar-industry references, although not having similar-industry references doesn't preclude him being able to help you. . . . It's like, how do you hire a good lawyer or accountant? It's the same principle. Word of mouth. Recommendations. Then talk to him, talk about his rates, what he can do for you. Obviously

you have to have a lot of personal rapport with the individual. If I'm going to work with you for 30 or 40 hours you'd better like me to some extent or at least feel confident that I'm capable, otherwise we're not going to get anything done.”

One thing you should look for is a consultant who will argue with you a bit. Mackie says, “If a company doing under $5 million of business a year came to me and said “We want an accounting package to run our business, will you write one?” the first thing I'd do is point out three or four good off-the-shelf packages and say, here are the limitations of each, you can't do this or this or this, but buy it and use it anyhow, because it's only going to cost you a couple of grand. If it were custom it would cost you 30 grand (and) then the chances of its working and being what you want are still 50-50.”

The consultants we spoke to generally agreed that in most cases you should be leery of bringing someone in to write custom software from scratch. Mackie says, “More and more I see large companies going into the computer store and deciding what they want and buying it, rather than going to a small company and having custom stuff done. Even if the off-the-shelf stuff doesn't totally meet their needs it's so much less hassle. Instead of spending hundreds of thousands of dollars you spend tens of thousands and it works virtually the day you buy it. We've got some pretty sophisticated stuff in the stores that's well identified as being good. As a corporation, why not buy that and spend $100,000 for 10 systems rather than going to a consultant and spending half a million and after 24 months of agony finding out that it isn't what you want?”

As a result, much of the “programming” done by the consultants we spoke to consisted mainly of producing templates for commercial software such as dBASE II or Lotus 1-2-3. In fact, Hare says that if a

client came to him and asked for something written from scratch in FORTRAN or C, “I would ask, why do you want to do that for a professional application? It's probably not necessary. I have people qualified in almost every language, but unless you're thinking about marketing it on your own, I would steer you away from that because the development costs are astronomical.”

### The vestigial consultant

An additional advantage of having your computer consultant develop applications within the bounds of a commercially available program rather than from scratch in a programming language is that it eases the process of making the consultant obsolete. Once you've had somebody develop an application in Lotus 1-2-3, for instance, it's much simpler to modify or adapt that application for different uses than it would be to modify a custom application in COBOL. And interestingly, unlike your typical lawyer or accountant, the computer consultants we spoke to tend to encourage clients to develop the expertise that would make the consultant unnecessary. Jeff Karp of Sensor-Based Systems, for instance, says “I would argue that it's easier to bring in a consultant on a one-shot basis and have him teach someone in the organization, because it offers that person a career path and makes them more interested . . . it's appropriate to have someone come in and help you over that first hurdle . . . but in the long run consultants are real expensive help, so you have to develop the expertise within your own organization.”

Pete Mackie goes even further, saying, “If a company has more than 40 or 50 people, you're almost going to have to have a microcomputer systems guy around.” James Hare agrees, but cautions, “You're not going to hire quality people for nickels and dimes. A lot of companies

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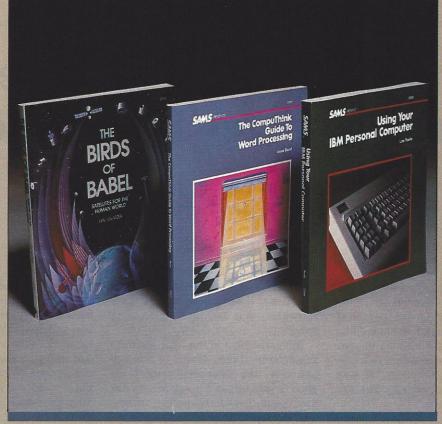
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# How Much Speed Does Your Computer Really Need?

Powerful processors can put you in the computing
fast lane—but do you really need to be there?

*by Jim Keogh, Associate Editor*

A friend of mine called me up the other day, all excited about his new purchase—a 16-bit personal computer. "It's great," he said. "The salesman in the store where I bought it told me it can process data *twice* as fast as an 8-bit computer. It was more expensive, of course, but the guy said it's worth it."

Being his friend, I hesitated to tell him that his purchase might not have been the revelation he thought it to be. I sympathized with him: After all, in an age where the obsession with instant, while-u-wait, on-the-spot, up-to-the-minute, faster-than-the-speed-of-light technology has crept into every corner of our lives, it's easy to get carried away with the idea of increased speed from that most promising of time-savers: the personal computer.

The fact is that with the onset of 16- and 32-bit personal computers, speed has become one of the most talked-about features among computer users. Salesmen tell you it's a must for spreadsheet and graphics applications, or anything requiring large amounts of mathematical calculations. But what they might *not* tell you is that the size of the microprocessor is not the only factor that determines computing speed. The microprocessor is only one of several elements that work together to run applications on your computer, and it's the relationship between these elements—plus outside considerations like peripherals and software—that add up to processing speed.

But since most of the hype seems to center around the number of bits you can buy, the microprocessor is as good a jumping-off point as any for an explanation of computing speed. The microprocessor is the heart of the computer; it does the mathematical and logical grunt work. It calls data from memory, processes the information and assigns the results to another memory location. It compares data and makes decisions based upon this comparison. When you ask your computer to locate a particular file, the microprocessor is the component that finds it for you.



Illustration by Jeff Moores

Microprocessors are commonly identified in terms of bits—8-bit, 16-bit, or 32-bit. The -bit designation refers to the amount of information the processor can handle internally—that is, in its internal registers. (Registers are simply storage locations inside the microprocessor.) An 8-bit microprocessor has registers that are 8 bits wide, and when it transfers information from one register to another, it does it 1 byte (8 bits) at a time. Sixteen-bit microprocessors can transfer information internally 2 bytes (16 bits) at a time, and so forth. So a 16-bit microprocessor can move data twice as fast as can an 8-bit microprocessor between its internal registers.

That's what happens inside the microprocessor. Outside, the world is very different. There, information moves over a collection of wires called a bus. Typically, microprocessors have two busses—a data bus and an instruction bus. The two busses are not the same size. A 6502 microprocessor, for example, has a 16-bit address bus and an 8-bit data bus. The 6502 is used in many personal computers, the most popular one being the Apple II. The 8088, used in the IBM Personal Computer and many of its compatibles, has a 20-bit address bus and an 8-bit data bus.

Why an 8-bit data bus? Bill Mitch of the Western Design Center in Phoenix, Ariz., and the man who designed the 6502 microprocessor, says it's simply a matter of economics. It's easier and more cost-effective to use an 8-bit data bus because of the configuration of other components in the computer, particularly the ROM.

The address bus is wider because the amount of memory the microprocessor can address directly is a function of the width of the address bus; the more lines in the address bus, the more memory the microprocessor can directly address. The relationship isn't linear—it's exponential. An address bus with only one line could distinguish between (address) only 2 bytes of memory—the byte at address 0 and the byte at address 1. If there were two lines in the address bus, then the microprocessor could address four locations—address 00, 01, 10, and 11. That's because the signal inside the computer can have only two values: 0 and 1. Signals that can have only two states are represented by this kind of number, called a binary number.

An address bus with one line could address two locations, or 2 raised to the first (the same as the number of lines, or bits in the address) power. The 2-line address bus can address four locations (2 squared). Similarly, a 3-line bus could address 2 cubed (eight) locations, and so forth. The 16-line bus of the 6502 can address 65,536 locations ( 2 raised to the 16th power). The 20-line bus of the 8088 can address 2 raised to the 20th power locations. That's more than 1Mbyte.

But the address bus has no relationship to the data bus. If the data bus is 8 bits wide, then data move over the bus 1 byte at a time. There can be a lot more bytes in the memory, but they only get to the microprocessor 1 byte at a time. It's as if you only had one bridge leading off an island, and the bridge were eight lanes wide. Only eight cars could cross a particular line on the bridge at a time. Whether there were 65,536 cars trying to get over the bridge, or more than a million, the rate of traffic flow would be the same, assuming all the drivers obeyed the speed limit.

You can think of a 16-bit microprocessor with an 8-bit data bus as a bridge from an island. If the microprocessor has 20 data lines, then it can tell more than a million individual cars to come over the bridge. But they can only come eight at a time. If the highway on the mainland side of the bridge has 16 lanes, then once the first eight cars came across, they

*A 16-bit machine will shift data within the microprocessor twice as fast as an 8-bit machine.*

could go into the left-most eight lanes, and the second eight could go into the right-most eight lanes. Then all 16 could move away from the bridge together, effectively doubling the rate of auto flow on the mainland—the microprocessor.

### What it all means

Essentially, what all this means is that if you have an application that calls for a lot of data movement within the microprocessor, then a 16-bit machine will shift that data twice as fast as an 8-bit machine will. The problem is that most applications call for more than that. They require loading information from memory, and writing information back to memory. If the processor has an 8-bit data bus, data going to and from memory are stuck with the eight-lane highway.

Worse yet, as far as the processor is concerned, instructions are treated the same way as data. So if a processor is using 16-bit instructions, it can only acquire those instructions 8 bits at a time. It can't do anything without instructions, so it has to wait until the whole instruction is loaded before it can execute. It's as if a drill sergeant were to tell his platoon, "All

right men, here's what I want you to do," and stopped. The men would all wait for the next part of the instruction, which might be "We're going to police up the area," before they could begin to execute the instructions.

Not all instructions for 16-bit microprocessors are 16 bits long, but those that are require twice as long to be understood as do 8-bit instructions. That means that for some operations a 16-bit microprocessor can be slower than an 8-bit machine, if all other things are equal. Which of course, they never are.

One of the things which is almost never equal is the clock speed. Computers are synchronous digital machines—each part in the computer can only do something when it's told to by the clock. The clock is like an orchestra conductor who tells each musician when to play the next note, and all perform the next note at the same time.

Obviously, the faster the clock goes, the faster the computer operates. That's one reason why people say a Z80H is faster than an 8088. The 8088 uses a clock rate of 6 MHz (million cycles per second) while the Z80H runs at 8 MHz. But there's yet another complication.

The instruction set of the microprocessor can make a fast microprocessor look like a turtle, depending on the way it's organized. There can only be one operation per clock cycle. If one instruction is one clock cycle, well and good. But some instructions can take as many as four clock cycles. So you could say that such a processor has an effective clock speed for that operation of one-fourth its advertised clock speed.

My friend with the new computer probably should have considered some of these things before shelling out the bucks for a 16-bit computer. Of course, he couldn't start ripping apart computers to change around microprocessors or mix and match busses, but he would at least have had a better idea of the factors that influence processing speed. Armed with this understanding, he could begin to look at some outside circumstances which can also affect the speed of his system.

### The outside influence

So far we've only been concerned about transmitting and processing the information inside the personal computer. But more the case than the exception, your computer is de-

pendent upon outside means to receive this information.

Personal computers receive information via the keyboard; programs and data are loaded into the computer from a disk drive; a modem is used to send and receive information over telephone lines, and the speed of each of these peripherals has a direct bearing on how fast your computer can process information.

Take disk drives. The capacity of the disk used in the floppy drive can slow down your applications programs. In a sorting sequence, for example, more than one file disk might have to be used. Changing floppy disks in the middle of the sort delays the processing of information.

Many of the delays involving the floppy disk drive have been improved through the use of a hard disk. The seek-time of a hard disk is 10 times faster than that of a floppy disk drive. A hard disk can also store vast amounts of information, eliminating the need to switch disks during a sort.

Each peripheral has its own delay factor. For example, a modem can also slow the flow of information into the computer. The speed at which modems send and receive information is called baud rate. Modems are

commonly 300 or 1200 baud. What this means is that a 300-baud modem sends information at 30 characters per second, while a 1200-baud modem transmits at a rate of 120 characters per second.

Still other delays in the speed at which your computer can operate are caused by information leaving the computer. This may sound strange, but most personal computers today can do only one thing at a time. The computer is given an instruction by the computer program such as call up a file from the disk drive. Until the disk drive spins, finds the file and the file is received by the computer, the rest of the computer sits and waits.

For example, when the computer prints a document, it appears the printer is busy zipping out characters onto the page while your computer is just sitting there. When the microprocessor receives the command to print from the computer program, the microprocessor calls characters from memory and sends them to the expansion slot in your computer that contains the printer interface card. This transmission occurs one character at a time. From the printer interface card, the character is sent to the printer and is printed.

While this is taking place, the computer is waiting for word from the printer that the printer is ready to receive another character. Until the printer sends this signal, the computer just sits there. How long will the computer be idle? This depends on how fast the printer can complete this cycle. The speed of the printer is measured by the number of characters that can be printed each second. Obviously the more characters a printer can print in a second, the less time your computer will be waiting.

### Improving the speed

As computer technology develops, you can expect to see both the speed of your computer and the speed of peripherals increase appreciably. In years to come computers are expected to employ solid state disks to augment the mechanical floppy disk drives. A solid state disk is a large bank of computer memory that retains information when your computer is turned off.

In the meantime, there are ways in which manufacturers of computer equipment have increased the speed of the computing process. One of the popular ways is through a buffer. A buffer is a bank of computer memory

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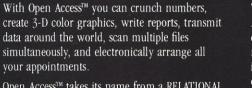
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that is separate from your computer's memory. The computer handles a buffer as another peripheral, like the printer or disk drive.

Buffers are particularly useful for increasing printer speed. Recall that your computer must wait for the printer to finish printing before another character can be sent. This is not the case when a buffer is used between the computer and the printer. When the print command is given, your computer loads all characters from the computer memory into the buffer. The printer then handles the transfer of these characters with the buffer—not the computer. As soon as all the characters are loaded into the buffer, your computer is free to do other things.

The buffer must have enough memory to store all the characters in the document, however. If the buffer doesn't have enough memory to store all the characters, the computer's memory will be used to hold the characters until more buffer memory is free. When this happens the computer must wait until some of the characters in the buffer are printed. Unlike your computer, once the characters are printed from the buffer's memory, the characters are no longer stored in the buffer.

We haven't covered all the bases in the speed issue; we've been concentrating on hardware that limits the speed of the computer, but this is only part of the problem. Instructions given to the computer to manipulate data also have a direct influence over the speed at which your computer functions.

Computers operate at optimum speed when program commands and data are entered directly in machine language. Unfortunately, machine language isn't the easiest programming language for programmers to write; writing instructions in a series of 0's and 1's is more complex than writing them in English.

Assembly language is a common programming language that condenses the bytes of instruction and data into symbols and numbers which are easier for the programmer to work with. These instructions are directly converted into machine language.

Programming in Assembly language requires that the programmer have a good understanding of how information is moved about inside the computer. The programmer must be familiar with the architecture of the microprocessor and a host of other internal operations of the computer. Because this can get confusing, other programming languages have been developed that permit the programmer to use instructions written in English to control the computer. The most popular of these is BASIC. No knowledge of the internal workings of the computer is necessary to write a program in BASIC.

When a program is written in BASIC, the computer must interpret the BASIC instruction into machine language. Whenever the computer is required to translate any instruction into machine language, additional microseconds are used for every command that is executed. While a microsecond may not seem like much, they add up, and the effect becomes noticeable in a lengthy program.

The customer who thinks he is buying a fast computer based solely on the size of the microprocessor might be disappointed: Although he may not be directly involved in developing his own programs, he'll be using prepackaged software sold by the dealer. The language in which these programs are written will be a determining factor in how fast the computer will process the information. The best bet is a program written in machine language or Assembly language. Coming in a close second are programs written in Pascal or Compiler BASIC.

So, computer speed involves more than a 16-bit microprocessor—it involves a complete computer system. The combination of disk drives, printers, cables and software all have a direct bearing on the flow of information. Because of this, careful planning must go into exploring all the facets of the complete system before a purchase is made.

### Do you need a fast computer?

Owning a fast computer is like owning a fast car. All the power you'll ever need is there at a moment's notice, but will you ever use it? With a fast car, chances are you won't get many opportunities to let the full power of the car loose on the open road. The same could be true about a powerful computer. You usually pay extra for this power, and unless speed is critical to your application, you'll be paying for more than you need to get the job done.

Conceptualizing the speed of a computer may be difficult. To better focus on the idea of speed, consider for a moment the sorting of files. Some programs and computer systems can take up to four minutes to sort 100 files. Is four minutes too long? The response is subjective. When compared with manual sorting, the software outperforms the clerk. However for users who demand instant results, four minutes can seem like an eternity, especially if there are several hundred files to sort.

Before signing the sales contract, make sure you know how you intend to use your computer. For processing or sorting large data files, you'll need all the speed you can muster from your computer and its peripherals. But for less demanding non-database applications you may find that the normal computer speed will get the job done efficiently.

Explain your needs to your dealer, and ask to be put in touch with other computer users who are in a situation similar to yours. Contact those users, and you'll be surprised how willing they are to share their experiences in buying and using a system.

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# Starting From Scratch
# With A Data Base

A do-it-yourself data base may be the solution to
your information management problems

*by David Gabel, Senior Editor*

**D**ata-base management systems are a bit of a paradox. They hold out the promise of the kind of place-for-everything-and-everything-in-its-place organization you'd sell your birthright to have in your business. Order, quick access, new perspectives on your work, sorting, merging—they're all part of the enormous capability of data-base managers. But when you actually sit down to contemplate using one of these marvels, you're apt to find your dreams crumbling under the weight of the thing. As you wade through documentation and marketing hype, you may wonder how a data-base manager will ever fit your specific work. And you may even find yourself more confused than when you started.

It's an understandable dilemma. Data-base managers *are* complicated—they have to be, in order to perform all the functions they do. But using them doesn't have to be complicated. With a basic understanding of what they do and how they do it, plus a good knowledge of your own business needs, you can set up a data-base-management system that will let you do just about anything you want with the information you have.

Of course, this all takes time. But once you have a clear idea of what you want to do, it becomes simply a matter of figuring out how to set the system up in the minimum amount of time and get maximum benefit back out of it—how to minimize your investment while generating maximum return on that investment.

But first things first. How does a data base actually work? Here's what happens: You store representations of information in your computer. The program is usually designed to make it seem like you're doing the same thing with your computer that you would do on a sheet of paper. Thus, you input information with a "form," something that appears on your screen with blank spaces where the actual data is to be input. The forms are organized into "files," just as they are in a file cabinet.

If you're trying to put your business data on a computer with a data-base-management system, you can design data-input forms modeled on your present paper forms. Some systems, like VersaForm from Applied Software Technology in Monte Sereno, Calif., are so good at form specification that they will let you design a form on the screen that will print to preprinted forms you're already using. Others aren't that flexible, but whether yours is or isn't, you'll still have a whole bunch of "forms" that your computer will put on some kind of storage medium—floppy or hard disk. Information

stored this way won't replace the paper forms you need to do business—things like invoices, bills, receipts, shipping documents, and so on. But with a data-base manager, you can generate the information from your computer instead of from a battery of typewriters, and you can easily extract information from the forms to create management reports that will help you make better business decisions.

John Page, vice-president of software development for Software Publishing Corporation, in Mountain View, Calif., which publishes PFS, observes that a data-base manager is to text what a spreadsheet is to numbers. Here's what he means: You can manipulate numbers very well with a spreadsheet. You can build in all sorts of complicated interrelationships of one number to another, in what we commonly call a model. The term "model" is used here as it is in mathematics or engineering, to mean a rule or set of rules that predicts the behavior of a system. You can get information about the modeled object by looking at it in different ways.

Data-base-management systems also let you observe real systems in different ways, by the way you describe and measure them. You describe the real system by inputting the data into the data-base management system. You measure the real system by getting data back out of your data base in different ways.

That isn't the easiest piece of logic to follow, so let's look at a real example, one that John Page talks about. Suppose I had a car fleet I wanted to manage with a data-base management system.

"I tell people," says Page, "that they have to have two different kinds of information about the items they're describing. There has to be information first of all that will uniquely identify the particular object in question. In the case of the car fleet, that could be the license number of the car, or the ID number.



Photo by Ross Elmi

"Then you have the information that can be thought of as attributes. Such things would be the color, the number of doors, the number of cylinders in the engine—any kind of descriptive information you can think of. This works with any kind of record keeping—identifying information and attribute information. After you've got that idea and start using the data base you've structured that way, you'll understand pretty soon how to go about manipulating the data."

Expanding on that example, let's think about all the information I might want to have available about the cars in a fleet. As Page says, I'll need to have some identifying data. Let's assume I select the vehicle license number, and assume further that it is composed of three letters followed by three numbers. If I want to be able to recall information about particular cars quickly, it makes sense to have this be the first item of information in the form. Most data-base managers can search quickly for the first item in a file, but a search takes longer on items that are buried.

I might want to know how many cars in my fleet have eight-cylinder engines, and how many have four doors. I'd probably like to know who the assigned driver is. I'd also likely want to have a place for the mileage at the last periodic service, so I could flag cars that are due for service. And let's not forget the color.

Notice that, so far, this has been a thinking process. As I've gone through it, it's probably far from exact, because I lack expertise in the car-fleet business. With better knowledge, I could probably come up with a better list of attribute information. But so far, I haven't touched a computer for this data-base application. It's all thought.

There finally comes a time when you have to sit down at the computer and get to it. Somehow, thinking seems to be easier when you're actively *doing* something at the same time.

### UNDERSTAND YOUR DATA NEEDS

You can't know how to use a data-base management system without knowing the information you want from it, and how the program will get the information and present it to you. You have to determine what you're doing now, and then what you could do with a data-base manager.

I sat down at my computer and started to design a data-base management form for a car-fleet business, armed with the somewhat sketchy thoughts I've already described. While I was doing that, I realized that it might be nice to list the optional equipment each car had, so I did that in the form design.

The one thing I knew I'd need from the output was a way of deciding which cars were due for maintenance. The form I used was designed on PFS, so I had to operate within the parameters of that program. The report generator can print nine columns of information in a report, so that's the maximum number of columns I could have. What information did I need in the report?

Since I wanted to select those cars which were due for maintenance, I needed to list the mileage since last service. With any kind of data-base manager, there are two ways I could have done this. The first was a computed field on the form, the second was a computed column in the report.

A computed field would be automatically filled in at the time the program received the information it needed to do the computation. A computed report column would be filled in at report-generation time. I didn't have the computer-field facility with PFS, so I determined that I'd have to use a computed column. Happily, PFS:Report let me compute any column in the report, even the first column, which is the column upon which the report is automatically sorted. So when I specified my maintenance report, I specified that column 1 would be the difference between column 5 (current mileage) and column 4 (last service mileage). This kind of specification slows a report down somewhat, because the value for the sorted column must be calculated before the column is sorted. I didn't notice any real slowdown, but then I didn't have a lot of data to be reported.

What resulted from the report specification was a report that showed all the cars selected from the fleet, listed in the order of their service interval mileage. The report also listed the license number of the car (the information that uniquely identified that auto), and the assigned driver. Also listed were the mileage at last service and the present mileage. While these qualities weren't needed for the specific purpose of the report, they were needed to calculate the first column, so they had to be included. I could determine which cars needed service by simply scanning column 1 to find those cars which were over some limit in service interval.

This was the first purpose of the data base on the car fleet, so this was the first report I designed. But now that the form that specifies the data base is here, and there are some data entered, I can use the capabilities of the data base for manipulating data to look at the car fleet in different ways—to measure the model differently to get different descriptions.

How many cars, for example, have eight-cylinder engines? How many cars have exceeded 60,000 miles, and

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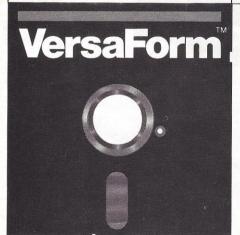
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## 2
### SPECIFY YOUR OUTPUT REQUIREMENTS

While you can't know everything you'll need from your data base, you do know certain recurring reports that are needed on a continuing basis. Determine how these reports will be structured.

## 3
### SPECIFY YOUR INPUT REQUIREMENTS

Input needs are set by the output you know you'll want. Whatever you want presented as output will have to be put in sometime.

easy as it sounds. Knowing just what the business does, and what you want to look at (the data you need to capture) is the toughest part of using a data-base manager.

Frank Woosley is the manager of consulting services for Deloitte, Haskins & Sells, a big-eight accounting firm with headquarters in New York. Woosley works out of the Little Rock, Ark., office with clients from all over the country, helping them use personal computers in their businesses.

Woosley says his service is pretty simple. "One of our senior consultants spends a day with the company, and then he comes up with recommendations that he puts into a report. Essentially, we ask people what they do, and then we tell them what they could be doing and should be doing with a computer. Our report will contain recommendations on both hardware and software."

Woosley has worked with dBASE II, but most of the time he goes with InfoStar, from MicroPro in San Rafael, Calif., because, he says, it's easy to use. But you have to know what the computer can do, he says. "You have to understand that you're simulating files on the computer. Then, before a customer tries to actually program something with a data-base manager, we look over his shoulder. We'll say something like, 'You can't do that, look at the file structure here. That won't work.' The people who really need to use computers are business people, and they just don't think the way computer programmers do. We help them over the rough spots."

It's nice to have someone to help you over the rough spots, but suppose you don't have that person, for one reason or another. Then you get to work out the rough spots yourself. Woosley says that using a data-base manager is really a shortcut for using a programming language to get information into and out of a computer. In a sense, that's true for any of the

which ones are they? Perhaps I might decide that cars over that mileage should be eliminated and new cars purchased to replace them. I can also develop a report that shows the options installed in cars, listed in a number of ways: by option, by groups of options, by car license number, and so on. Then I can determine my option mix to see if I have too many high-priced options or too few.

Thus the data base that describes the real car fleet serves as a kind of a model of that car fleet. Using this model, I can determine all sorts of management information to help manage the fleet. Just as a spreadsheet would let me model the financial activities of the fleet, if it were, say, a rental fleet that I was managing for a profit, the data base allows me to model the real characteristics of the fleet, to spot trends and change things that need changing before they get out of hand.

You can do the same thing in your business situation, no matter what the situation is. The problem, and it is a problem, is similar to the one that confronts you when you try to model anything. You have to know what you're modeling, and that isn't as

products called data-base managers, from the simple filer programs to the complex relational data-base managers. The simple act of painting a form on the screen is, in a sense, programming. Using a data-base manager is a shortcut because most of the programming is already done for you. That's why, as Woosley notes, a data-base manager is easy to set up for a particular application if there's no commercial program available for your application.

But notice that the first step for Woosley is the determination of what people are doing now, followed by a recommendation about what they could and should do with a computer. That has to be your first step, too. Determine what you are doing, then what you could do. "If you're not doing it by hand," Woosley cautions, "you won't do it with a computer." Not that you might not add applications later, after you've been using a data base for a while. "I tell people to just turn on the meter and go. After four months, the computer will be an extension of their imaginations," he says.

That's four months down the road, though. How do you get started? "A data-base manager consists of two

parts," Woosley says, "the file manager and the report generator. You have to know what information you want from the report generator, and where it is going to get the information." That means, of course, as we've already said, that you have to know what you're doing, what information you have now, and where you get that information. You move on from there.

One person who found this out, albeit the hard way, is Larry Weiss. He's the energy supervisor for the Snohomish County public utility district in Everett, Washington. He uses PFS on an IBM XT to keep track of energy-conservation grants expended in the district.

Weiss explains that consumers can request energy-conservation grants based on surveys the utility district performs. After the grant money is awarded, contractors are picked to do the work, whatever it is—insulation, new windows, and the like. Weiss and the utility district have to track the expenditure of the grant money, though, which is funneled through the utility district from the Bonneville Power Commission to the contractors for the consumers.

"The basic thing," says Weiss, "was we knew the paper system we were using. We wanted to make sure that any computerized system we put in reconciled with the paper flow, so we wrote new procedures to monitor that flow to make sure we'd be compatible."

Weiss started his system using Apple II Plus computers with a Corvus hard disk. He set it all up to track each job by the customer who was getting the work done. "We started right off by tracking too much," he remembers. "We didn't think about what we needed. It was a conflict of wants and needs. We didn't need to track the work by customer, and the customer didn't need the information we were keeping. On the other hand, the contractors did.

"All our contractors—there are

## DETERMINE FILE STRUCTURE

Some applications will call for only one file of information, while others will demand multiple files. If you want multiple files, they may have to be linked through a choice of a data item common to all files in the data base.

about 150 of them—aren't the best bookkeepers. We needed to track what they were doing, and they needed the information, too. So we thought, 'Why not do this by contractor, instead of by customer?' Now we can keep the information on the contractors to give them a report on how many jobs they have and so forth. We also track the jobs. If it wasn't completed, for example, now we can note why."

With his Apples and the hard disk, Weiss was tracking 27,000 jobs at an average cost per job of $2200. He says the data-base manager allowed him to reconcile the district's records and the contractor's records to within $69,000, which he reckons as pretty good for this kind of a problem.

Once he had his files organized on the Apple by contractor, he devised a simple way to update the files on a daily basis. "We had one disk per contractor," he says, "on which we recorded all the pertinent information about a job. All the contractor files had the same form design. Then we had a work file that also had the same form design. Daily updates to the files would all be made to the

work disk. Then we'd copy the information from the work file to the specific contractor files using the 'copy-selected-forms' function of PFS."

Weiss says that once he moved to the XT he didn't need the contractor disks any more; they're all stored on the hard disk in the system. "We just started on the XT in October," he says, "and we're already up to 300,000 bytes on the system." He uses floppy disks to back up the files on the hard disk, just in case there's trouble.

There were some things he just had to learn. Each contractor has a code number, for example. He learned that the program sorts first on the data item that's in the upper left-hand corner of the input form, so that's where the contractor code number went. "If we didn't have that code in there," he says, "sorting would take a lot longer. Then we just learned to put dates in year first, followed by month, then by day, (830615, for June 15, 1983, for example) because it's easier to sort that way."

Weiss started with what he was already doing, and then went from there to putting his operation on a computer. Then he found that what he had wasn't what he really needed. This made him redesign his forms to come up with a good way to track the information he wanted to track.

It's probably a good bet that most people who put a data-base management-system into use wind up doing just what Weiss did: They find out that what they started with wasn't what they wanted, and they have to change it. If your program lets you change the form design and report specifications without rekeying data, that's not too painful a process, although it can take time. For this reason, most people would recommend that you test your system with sample data to make sure it will do what you want. Such testing will show you where you made simple errors before

## 5 DESIGN FORMS

Each input-form design will be determined by the characteristics of the program and by the file structure and output structure you've developed.

## 6 TESTING

You most likely won't get it right the first time. Prepare dummy data to test your data-base structure so you can get out obvious bugs before you commit to live data. Then, be prepared to change some things, even after live data are entered, as you encounter unexpected requirements.

there's so much data in the system that a redesign would take a major effort. After that, though, there's no substitute for working with live information to find out what you didn't do right when you started off.

Both the examples we've talked about so far are applications that could be accomplished using only one file. Well, that's not strictly true. Weiss used several files, but each of them had the same form design. There may come a time that one file on a particular subject may not be enough.

How would you know that? You probably wouldn't, at least at first. One of the questions you should ask yourself before you decide to buy a particular program in the first place is the need for relating information in one file to information in another. John Richardson, who is one of the developers of PowerBase, from GMS Systems, (New York, N.Y.) says that most people will answer that they really don't need it. Then they buy a data-base system, and in short order find they really could have used the relational capability. Not surprisingly, PowerBase is a relational system.

Before we get too far, let's define a relational data-base-management system. Simply put, relational sys-

tems are those systems that let you get information concerning one file in a system from data that's in another file. One consequence of this power is an expanded ability to look at your data in a number of different ways. For example, suppose you had a file of cars in a car fleet, and another file of gasoline disbursements from the fuel pumps. The car-fleet form could be similar to the one I used at the beginning of this article. The gas-disbursement form could have a field for the car's license number, its mileage at fill-up, and the number of gallons disbursed.
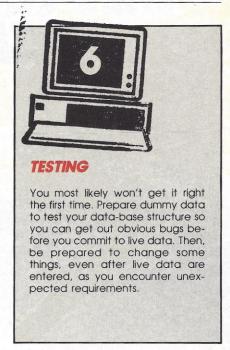
At the end of the month, you might want to determine the total amount of gasoline disbursed to the car fleet. You would structure a report from the gasoline-disbursement form to give you that information. Clearly, the report as structured wouldn't give you any information other than total gallons, gas mileage on a per-car basis, and total fuel usage. You could determine average fuel mileage, but that statistic probably wouldn't be very useful, because there are a lot of variables that come into play in fuel efficiency.

It might be useful, though, to be able to relate assigned drivers to fuel economy, or make and model of car to fuel economy. You might also want to correlate installed options, or number of cylinders. Then you might be able to make some decisions about purchasing cars for the fleet to minimize energy use based on real data, not assumptions.

If you have two forms, hence two files, and you don't have a relational system, you'll wind up printing two reports—one showing the cars with their drivers and their mileage for a month, and the other showing fuel consumption. Then you'll have to combine the forms manually to get the information you want.

Now you could put all this information into one form, but that could be a compromise. You'd need all the fields in the one form, even if you

weren't going to use them all. Even empty fields take space, because they have to have space reserved for them on disk. Of course, they take more space when they're filled up. Then, too, the more fields on a form the longer it takes to fill it, and in general, everything else will take longer, too. So it could be that it's more efficient to break an application like this into two files. Then a relational data-base manager can link you from one file to another.

It might seem that only relatively complex, sophisticated applications would require relating information from one file to another. This isn't necessarily the case at all. I have an application—a personal application—that I'm pretty sure requires a relational system. It sounds simple, but apparently it isn't. I want to keep a phone log, and then print a report at the end of the week showing whom I talked to, and for how long, and in connection with which story. I already have a file of persons I talk to on the phone, and I want to simply build another file into which I'll put the telephone number I called, when

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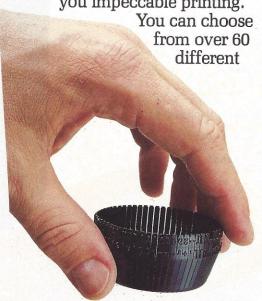
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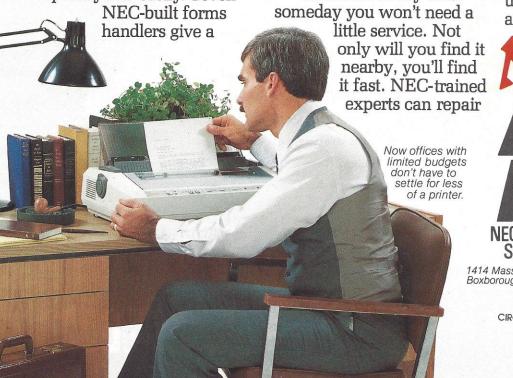
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CIRCLE 17

# When The Boss Gets A Computer

Your computer won't replace your secretary.
But it will change the way you both work

*by Kevin Strehlo, Associate Editor*
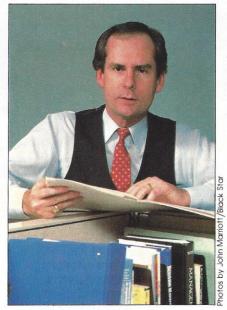
An increasing number of business people are finding that one of the ways a personal computer makes them more productive is by letting them take over some of the work their secretaries used to do. What, you ask? How can you become more productive by taking on more work? And your time is too valuable to waste on secretarial tasks, you say? Well, it just may be that you'll spend less time with your reports and correspondence if you take your secretary or word-processing pool out of the loop and do it yourself; as an added bonus, you'll probably find that your writing improves.

After we spend some time showing you how taking over some of your secretary's work can improve your job performance we'll deal with the corollary issue of how you can utilize the time your secretary used to spend typing. Although this sudden freeing of human resources poses a problem of sorts, it is the best kind to have. The people we talked to generally agree that, with a little creative management, the end result is that both secretary and boss are happier and more productive.

## Overcoming resistance

General Electric is an enlightened company when it comes to the use of personal computers to increase productivity. But this enlightenment doesn't go beyond spreadsheeting and



**Woody Tullis, an organization effectiveness consultant, uses computers to teach improved management methods.**

data-base managment to include word processing. Jeffrey Ehrlich, who oversees GE's application of personal-computing technology from Schenectady, N.Y., explains that the company's large investment in dedicated equipment for centralized word processing is partly responsible, as is a general feeling among GE managers that "typing" is somehow beneath them and not an effective use of their time.
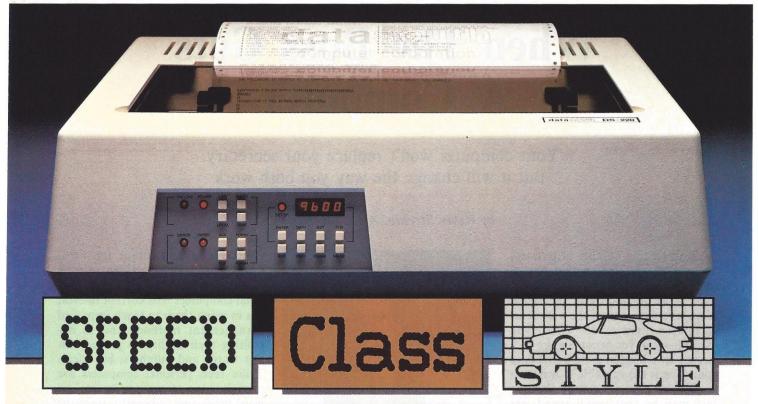
Woody W. Tullis, an organization effectiveness consultant for Fireman's Fund Insurance Companies, is another innovator in the use of personal computers. His current interest lies in using them to teach improved management methods and in exploiting their ability to process not just words and numbers, but ideas. Tullis feels personal computers are too valuable a resource to "waste" on word processing, especially since the company's centralized word processing seems to get the job done. "We don't want our managers to be using their computers for word processing when higher priority tasks have yet to be implemented on them," he says.

Other managers and executives have had similar attitudes turned around, however, by a little bit of hands-on experience with the benefits of word processing. Rolf Mast, director of research and development for consumer products with Lee Pharmaceuticals in South El Monte, Calif., was quite adamant about not wasting his time typing until, at the insistence of president Dr. Henry Lee, he began a word-processing program to do his weekly reports. Although at first his secretary continued to type his correspondence for him, Mast soon took that over too, even though he was only moderately proficient at the keyboard. The reason? He found the urging of his boss to be well-founded: He could do his

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CIRCLE 155

*Secretaries often pick up other duties when their bosses do their own reports on word processors.*

writing faster and better on his own.

John Schuller, who manages the sales efforts of an engineering group for Genrad in Washington, D.C., took up word processing without such high-level urging; in fact, he got involved in spite of the failure of a corporate plunge in that direction. A DECmate dedicated word processor had been sitting unused in a corner of the office for several months when Schuller decided to buy a Kaypro personal computer for his own use. Shortly after he got up to speed on the Select word-processing program that came bundled with his Kaypro, a sudden resignation left him without a secretary for two months. "Word processing saved my life," he recalls. When a replacement for his secretary was finally hired, Schuller, full of the zeal of a new convert to word processing, put her on the DECmate, typing out the 20- to 30-page quotes his department generated as part of the process of bidding for contracts. He continued to do his own reports and correspondence on the Kaypro.

"I turn out my weekly sales report by myself now in about 20 minutes," he says. "Before, even if my secretary wasn't stacked up with work, it took three hours to turn a report around; of that, about an hour of my time was involved to write it out by hand, redline the first go at it, and then proofread the final."

Rick Wohleber, who is in charge of supporting personal computing for Rockwell's Microwave Division in Richardson, Texas, agrees that it's faster to do his own memos, letters, and reports on his Apple Lisa computer than to go through the "rough it out, edit, and proof it cycle." Even a two-finger typist down the hall has found that it's faster to do reports himself, Wohleber says. Moreover, his colleague's conversion to Lisa-Write has simplified communications when he and Wohleber occasionally write a report together. They simply pass a diskette back and forth.

Leslie Rosen, president of Exposé,

a New York firm that specializes in publicity for the record industry, goes so far as to say that word processing has changed the way she works. "The ease with which I can write, edit, spit out copies, file, store, and retrieve, without secretarial assistance, is amazing," she says. "It's 3:15 right now and I know I have three letters to get out, but I'm not worried. My secretary can continue answering the phone, filing, whatever. I know I can zip through those letters and still be out of here by 4:30. And word processing means I have the time to be perfect."

Rockwell's Wohleber concurs. "You just work on it up on the screen until *you* are satisfied with it; only then do you print it out," he says. No longer must he send out reports that could stand a little more polishing, he says, and he joins Rosen in the observation that word processing may make messy "white-out" corrections obsolete.

"The improvement in appearance is really dramatic," elaborates Rosen. She credits word processing with actually bringing in some business
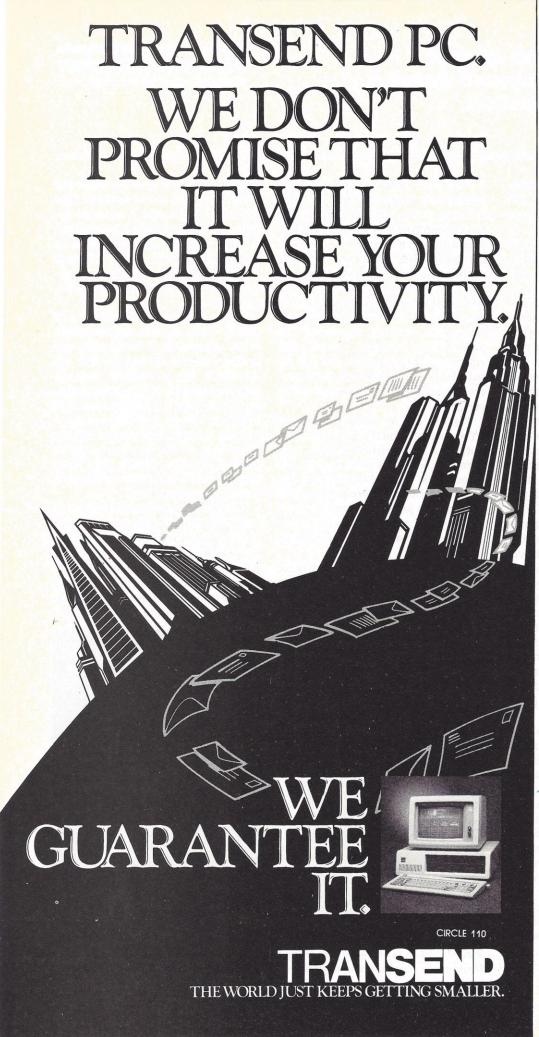
through a tightening of her prose and some thoughtful use of centered lines and boldfaced words. A letter on behalf of a client actually brought back a letter complimenting her work in detail, right down to the centered lines, and expressing interest in obtaining similar publicity services, says Rosen.

Many personal-computer users cannot claim similar improvements in the appearance of documents, and in fact turn out documents that are markedly less attractive because they're printed on a dot-matrix printer. But Genrad's Schuller notes that a kind of reverse snobbishness is beginning to make dot-matrix memos acceptable, if not *de rigeur*, within Genrad, because telltale dots show that the sender is a person of status: a personal-computer user.

The strongest argument in favor of business people using word-processing software, however, is improvement of writing. Gregory L. Kilsey, a senior analyst for the San Francisco venture capital firm of Hambrecht and Quist, says he was quite happy with the switch from us-

Rick Wohleber, in charge of supporting personal computing for Rockwell's Microwave Division, says computers have simplified management communications in his company.

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*The changes that result from managers
taking over their secretaries' work
can be turned to everyone's advantage.*

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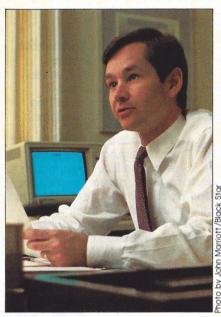
ing a secretary to doing it himself, even though he had never typed before he began to use his Lisa computer. "The kind of thoughtful, analytical writing I do was not conducive to dictation," he explains. "I can easily keep up with my thought processes despite my rather clumsy typing, and then I make use of the really slick features like cut and paste to improve my first draft." Kilsey discovered—as do most people who get the chance to edit their writing without the penalty of a retype—that the freedom to revise granted by word-processing software improves writing immensely.

Genrad's Schuller agrees. "Because I can delete things, and move text around, I'm so much briefer in my writing, so much more succinct," he says. He recalls one report he did over a weekend at home that demonstrated how much his writing improved when he brought the full power of his word-processing software to bear. "I worked at the report for an hour, went jogging, came back to it for another hour, watched a football game, and so on all weekend," he explains. "I eventually managed to cut 10 pages down to four very meaningful pages. It probably wasn't apparent to people who read it just how much effort went into it—they just thought it was a well-written synopsis of how a decision was made. But it impressed a vice-president here enough so that he made it the basis for a war game scenario for sales trainees."

### From grunt - to decision-maker

In some cases, when people who used to rely on secretaries to type correspondence and reports begin doing it themselves on a personal computer, the result is a reduction in the number of secretaries. Rolf Mast at Lee Pharmaceuticals, for example, says the company has saved significantly by nearly eliminating secretaries from the payroll.

More often, however, secretaries

Gregory Kilsey of Hambrecht and Quist says word-processing software improved his writing immensely.

Photo by John Marriott /Black Star

pick up other support duties to replace the typing taken away by the boss's use of word processing. Rockwell's Wohleber says that to some extent there will always be a need for someone to do support work. His secretary keeps pretty busy, he says, just with tasks that are supplemental to the production of the written word, including copying and distributing reports and producing transparencies for presentations.

Kilsey agrees that the need for someone to do support work will probably never end. "A program couldn't take the place of what my secretary does," says Kilsey, "simply because so much of it involves contacting people for me and managing my time." Expose's Rosen agrees, saying that better utilization of her time is near the top of the list of benefits resulting from her secretary's emancipation from typing.

"The time picked up certainly isn't wasted," says Rosen. "Every office has more work than you can do, so there's always something, even if it's just going through some magazines I

haven't had time for or getting ahead on a project." Although Rosen recognizes that this kind of "always something" assignment runs the risk of seeming to be mere busywork, she says the resultant potential for dissatisfaction is more than offset by the relief from boredom and frustration. "Was my secretary miffed when I took away her typing—are you kidding?" asks Rosen. Nothing is more boring, according to her secretary, than mechanically typing letters composed by somebody else.

Brice Schuller, senior vice-president of Scroggin & Fischer Advertising in San Francisco, says the installation of personal computers in the agency's office has, in essence, "taken people off clerical work and put them on the decision path." The upgrade in responsibility for the secretarial staff, he says, is in large part what has enabled the agency to double its billings while staff size grew only from 22 to 32 people. Moreover, the benefit of eliminating secretarial retyping from the copywriting loop is augmented by the elimination of expensive rekeyboarding and proofreading at the typesetting shop. The agency has saved 40 percent on its typesetting bill and reduced turnaround time by handing the typesetter a disk rather than a manuscript.

### Secretarial computing

Doing your own word processing doesn't have to take your secretary out of the written word loop entirely, however. Scroggin & Fischer's Brice Schuller says he often composes letters on the computer at his full typing speed, edits their content, and then passes a disk to a secretary. She corrects the typos, runs the letters through the spelling checker, adds addresses, prints out the letters in the correct format, and stuffs the envelopes. Howard Neal, a San Francisco lawyer, is just one of the many others who also pass disks to a secretary. Neal says time spent

It's up to management to utilize
the new people power of secretaries
no longer burdened with typing chores.

**PERSONAL PRODUCTIVITY**

formatting and printing is not time well spent by highly paid managers and professionals.

Rockwell's Wohleber concludes that whenever a manager spends much time using a personal computer, whether it's for word processing or for a task that falls outside the traditional realm of a secretary, the definition of a secretary's support role should expand to encompass it. "Most secretaries who report to senior executives at Rockwell have learned to use their computers," he says. "Executives don't have the time to type in a list of names of numbers, for example. Sometimes the support person will even set up a spreadsheet for them."
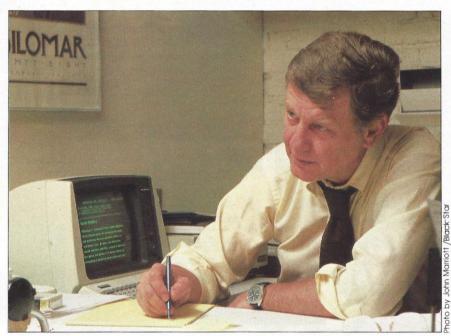
John Dunn, director of education for the Quest-Simtec chain of computer dealers, seconds this notion. Incorporated into Quest computer courses is the idea of leveraging time by allowing support employees to accomplish that part of a computing task that does not demand the skills of an executive. He paints the following scenario for an executive who doesn't have much time to use—or to learn to use—a personal computer. "Get this executive a Lisa, because the software is so easy for an executive to learn and remember how to use," says Dunn. "An analyst under him then does the initial work on a spreadsheet and passes the model he has built to the executive, who manipulates and fine tunes the numbers. He in turn passes it on to his secretary, who uses LisaGraph to turn those numbers into a chart, Lisa-Draw to enhance the chart for a presentation, and then incorporates the graphic into a report the executive roughed out for her editing using LisaWrite."

Another example of secretaries becoming involved in personal computing comes out of Beckman Instruments in Brea, California. The beginning of the story is familiar enough: Documents were processed by the word-processing department rather

slowly. In this case the Beckman engineers had to put up with nearly intolerable delays, because the word-processing department was in a neighboring city. A day to get there, a day or two for the work to be done, and another day spent in transit back to Brea for correction and resubmission really added up. When the engineers couldn't wait, secretaries typed up their longhand roughs and retyped each of the edited versions, but their



John Schuller, who manages the sales efforts of an engineering group for Genrad in Washington, D.C., saves time by producing his own reports on a personal computer.

workload was such that turnaround still wasn't fast enough. "The engineers finally broke down and learned WordStar," says Cathy Curtis, a microprocessor engineer who supports personal computers throughout the corporation.

Curtis leveraged the advantages of word processing by setting up a kind of template system with prompts that guided engineers, thus automating a process that was often slowed when engineers suffered from writer's block in front of a blank monitor screen. "We have to have someone go through it and clean it up, but at least

it gets the engineers to do their documentation," she says.

The secretaries' involvement in personal computing beyond this minor cleanup of WordStar documents includes use of SuperCalc and Multiplan. "They work with a manager to do departmental budgets and that kind of thing," says Curtis. Her engineering group also needs to keep track of an inventory of several million dollars worth of lab parts and

integrated circuits, she says, as well as a large number of purchase orders, and Curtis has gotten secretaries involved in data-base management. "They know how to enter data, sort, and search for data," she says, "and although they aren't setting up their own data bases yet, that should come soon."

At smaller firms, secretaries have even taken over the role, filled by Curtis at Beckman, of keeper of the computers. Howard Neal, for example, hired a secretary who already had some experience with computers and who quickly picked up the pro-

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grams and utilities being used on the San Francisco law office's TeleVideo computers. "We moved him into a management position of sorts to take advantage of his affinity for computing," explains Neal. "He not only manages the secretaries, he's also the most knowledgeable in the use of the timekeeping and billing software we run, and is currently in charge of getting us up on a general ledger program."

This trend toward secretaries becoming keepers of the computers is logical given their traditional role as keeper of other office equipment and their growing involvement in personal computing. But it in no way explains what happened at Rockwell when Rick Wohleber and his colleagues took up word processing. The excess of secretarial help, caused by the lightened typing workload, was handled by the promotion of one of the secretaries to the position of junior programmer.

Ordinarily, using a personal computer does not lead business people into programming, mind you. It makes sense in this case only because Wohleber was also involved in mini-computer and mainframe activities at Rockwell. "Programming was a natural for her, because she had been exposed to it and learned enough to know she wanted to take a shot at a junior programming position," says Wohleber. Of course, few secretaries are going to have a chance to become—or even want to become—junior programmers. "But the point is that in almost any department there is a similar need for a junior whatever," explains Wohleber.

### Using your secretary's knowledge

Certainly such promotions have not been extremely common in the secretarial ranks; people who've been in clerical positions for many years are often comfortable there, and harbor few desires to tackle new challenges. At least that's the common view: a perfect example, perhaps, of not be-

ing able to teach an old dog new tricks? "Actually," counters Wohleber, "I think the older person has an advantage in knowing exactly how a department operates." Wohleber is not alone in his belief that almost everyone has growth potential, and says the dilemma posed by managers taking on some of their secretaries' work can be turned to everyone's advantage. "It's not as if you have to throw secretaries with 20 years of experience out on their ears when they're displaced by a personal computer. It just calls for a little creative people management."

An obvious opportunity for such redefinition of a secretary's role existed at the law offices of Howard Neal when the lawyers there began doing much of their legal writing on a personal computer. Law offices typically have a hierarchy of attorneys, legal assistants, and secretaries, but Neal says most good legal secretaries are quite capable of the extra originality required for the legal assistant-type chores. Legal assistants prepare documents without benefit of a dictated tape or handwritten draft, going to a book of forms, deciding which one is appropriate, and getting the necessary information from client files to complete a draft. "I found that as a result of my abilities with the word-processing software, and because my secretary is spending less time doing raw typing, I can give her more responsibility in the preparation of corporate articles, or bylaws, or a set of interrogatories. I don't have to go to the book of forms or client file myself. Instead, I just edit her draft, coming to some judgment as to whether the language really applies to the case, making revisions if it doesn't, and then hand it back to her to get it into final form for printing. As a result, then, of learning word processing, Neal says the office has been able to leverage the abilities of its secretarial staff and avoid hiring more legal assistants.

Jackie Garcia was similarly le-

veraged by California-based Creative Home Loans when the introduction of a computer took away her typing chores. Because she knew a lot about the company, and had been in constant contact with the real estate brokers who gave the company their business, the company decided not to lay her off. "The logical thing to do with me was put me on new business development," she says, "but I needed a real estate license for that." She was quite enthused when, typing behind her, she was sent to school to prepare for her real estate board exam, in the meantime assuming a support role in escrow development.

A similar scenario ensued at the Genrad department under John Schuller, where secretaries who once spent time typing reports and long quotes now had the time to organize leads for the sales force, compose follow-up letters, and do other work that was more marketing oriented.

"The key is that they're relieved of all that tedious typing," says Schuller. "They were happy to let the computer take over their grunt work, and not just because it gives them more free time: it's because they now have more creative work to do."

### Managing the new secretary

The impact on managers of secretaries who are no longer burdened with stacks of typing is obvious: It is up to management to decide how to utilize the new people power. Brice Schuller has spearheaded the introduction of personal computers and word processing throughout Scroggin & Fischer Advertising. His secretary no longer does any typing. Brice brought her along slowly in various computer tasks to fill that free time, teaching her how to use the agency's data-base management system sort program, helping her build report forms until she got the hang of it, and got her started with a spreadsheet program, until she had been upgraded, essentially, from clerical duties to

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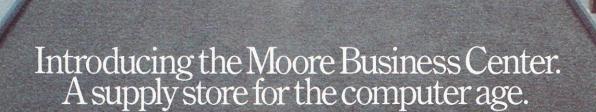
It's not that you're being totally ignored—nothing that damning.

But you've discovered that most of your questions deal with "after products," an area the manufacturer cares little about.

He's not exactly a storehouse of knowledge. His inventories are only so-so. And he's definitely not price competitive.

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# A Complete Buyer's Guide To Hard Copy Graphics

Print and plot your way to elegant presentations
with the latest in graphics hardware

*by Elliot King*

As desk-top computers proliferate in the corporate environment, graphics are playing an increasingly important role in business computing. Managers who once struggled through reports jammed with long rows of numbers are now making use of effective, colorful graphics to analyze and present data. Graphics make it easier to spot trends and relationships as well as to communicate ideas. Facts and figures can be put in a streamlined and readily understandable form.

But simply producing multicolored pie charts on a personal computer monitor for analysis purposes can't satisfy the needs of people who must share that information with business colleagues, supervisors, clients or committees. When it comes time to share the information, you just can't expect the members of the board of directors to huddle around the CRT.

Just as computing power itself was long barricaded behind data-processing doors, business graphics for presentation have long been monopolized by in-house audio-visual or art departments. If a manager needed overhead transparencies to complement a presentation, an outside artist would be summoned to draw and produce the charts and graphs. The process

*Elliot King is a Los Angeles-based freelance writer.*

The three-dimensional bar chart shown above was produced by the Diablo Series C printer (Diablo, Fremont, Calif).

could take days or weeks, incurring a substantial cost along the way.

Today, the graphics department's monopoly has been smashed by a wide range of computer peripherals—graphics-output devices—that can take the colorful graphics displayed on the screen and transfer them onto paper, transparencies, or slide film, producing a hard copy of the information as seen on the monitor.
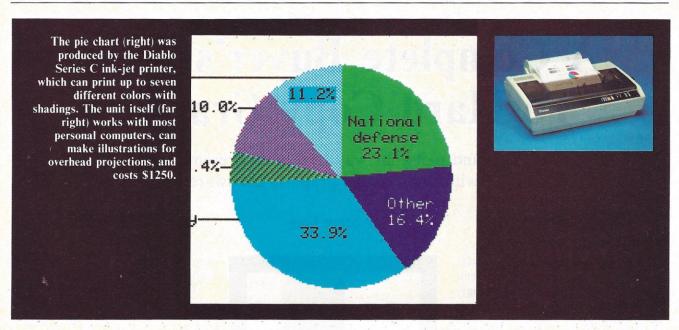
## Output options

The graphics-output devices used to produce these effects can be grouped into three broad categories: Dot-matrix printers, plotters, and devices that read information directly from the video output to create slides. Each of these approaches has its strengths and weaknesses. Your choice of output device will depend on the specific tasks you need done, and the problems you want to solve.

Graphics-output devices carry a rainbow of price tags, starting as low as $119.95 list for a 40-column, thermal dot-matrix printer that works with the Commodore and Atari personal computers to more than $7000 for a top-of-the-line slide-maker.

And as with all computer peripherals, you have to avoid compatibility problems: Certain graphics programs will work with certain output devices; a printer may not be compatible with

The pie chart (right) was produced by the Diablo Series C ink-jet printer, which can print up to seven different colors with shadings. The unit itself (far right) works with most personal computers, can make illustrations for overhead projections, and costs $1250.

various personal computers; a computer may not have the ability to handle information in a form required by an output device. Before you make your purchase, make sure that every part of the system will work with every other part.

### Dot-matrix graphics

According to Future Computing, a Texas-based market research organization, the dot-matrix printer is the most common hard-copy output device. It estimates that in 1983, one million dot-matrix printers of all types will be sold. By 1988 that number could grow to four million. People turn to dot-matrix printers because they are fast, relatively inexpensive, and have a graphics ability lacking in the fancier, letter-quality printers. In addition to words and numbers, most dot-matrix printers can produce bar charts, pie graphs, pictures and other graphics from the information represented on the computer monitor.

How the information is transferred varies. To print text, dot-matrix printers use a configuration of elements in the print head that transfers sequences of dots to the paper to form images. Different types of dot-matrix printers perform the transfer in dif-

ferent ways, but to print simple text on a page the printer receives ASCII code—a standard way to represent letters and numbers—from the computer, and the correct dot sequence is fired. But in the graphic mode, dot-matrix printers require information in a completely different form; every single dot must be controlled.

Imagine a colorful pie chart representing the different profit centers and the percentage of revenue they bring into your company. You want to include that information in a memo you're preparing for your supervisor. No standard code exists to transfer graphic representations from the computer to paper; instead, the computer scans the screen and notes which pixels (the dots of light that form the picture on the monitor) are illuminated. The computer transfers the information about the color of each pixel to an area of the computer's memory reserved for that purpose. This transfer process is called bit-mapping (also known as rasterizing, after the beam that illuminates pixels in a monitor).

But before you decide that bit-mapping is for you, make sure your computer can handle the procedure. Depending on the resolution of the
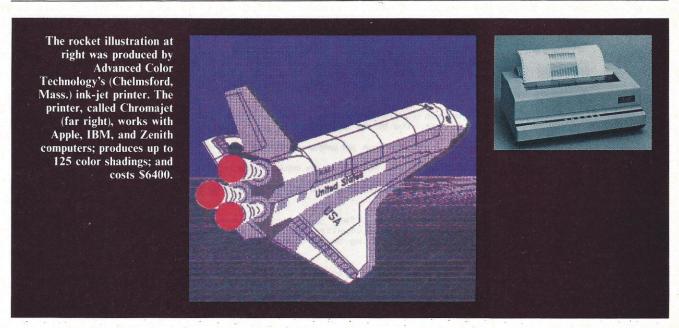
screen you are using, your computer will have to dedicate a certain amount of memory to the task. The higher the resolution, the more memory you'll use. A high-resolution screen with 640 pixels horizontally and 400 pixels vertically, for example, will require more memory than a screen with 320 pixels by 200 pixels. If you do have a high-resolution screen, you may want to consider purchasing a more sophisticated 16-bit computer to do the job.

After the information about the color of each pixel is transferred to the computer's memory, the video information is sent byte by byte to the printer, instructing the print head to print. This process of recreating screen graphics on the paper is called a screen dump; what you see on the screen is approximately what you will get on the paper.

Bit-mapping is by far the most common way to transfer graphics information to a dot-matrix printer, but there is an alternative: sending vector information to the printer. In this way, the software program instructs the printer to draw a *line* of a specified length, thereby bypassing the bit-mapping approach.

Just as there are alternate ways to

The rocket illustration at right was produced by Advanced Color Technology's (Chelmsford, Mass.) ink-jet printer. The printer, called Chromajet (far right), works with Apple, IBM, and Zenith computers; produces up to 125 color shadings; and costs $6400.

transfer graphics information to the printer, the printer can also use alternative methods to print the information. The most popular method is the impact method, in which each byte of information sent to the printer activates the solenoid (a coil of wire) in the print head. The print head contains a set of tiny wires, and as each pixel location is identified, a wire shoots out of the print head and strikes the ribbon, printing a dot on the paper. Different impact printers have a different number of wires. In the graphics mode, not all the wires are used at one time.

### Seeing it in print

If you want to get color graphics with an impact printer, you'll need to have a multicolor ribbon. Generally such ribbons contain four colors: cyan (greenish blue), magenta (deep purplish red), yellow, and black. In different combinations, cyan, magenta and yellow form red, green, and blue. All together they make black— but not a vibrant black, so black is generally included as a separate color.

An impact printer produces color graphics in one of two ways. It will either print one color at a time and constantly pass over the same line until all the colors have been printed, or create color by overstriking. Using the overstrike, when the print head arrives at the edge of a page, all the colors will have been printed.

When shopping for an impact dot-matrix printer, there are a number of factors you should consider. One is that the print head has a tendency to wear out. Its life will be rated in terms of millions of characters, and a good print head will have a life of about 500 million characters.

A second factor to consider is how much use the printer will get in an average day in the office. The solenoids and the print wires have a tendency to heat up with repeated use, and less-expensive dot-matrix printers may not be able to stand up to constant use. Indeed, some are built to be functional for only about 10 percent of the work day.

A third point is that the quality of ribbons tends to diminish with use, which simply means that a ribbon that gives the crisp impression on the first use will fade after a while.

The quality of the graphics produced by dot-matrix printers is not measured only by how crisp the image is, however; it is also measured in dots per inch, which are calculated horizontally and vertically. Seventy-two dots per inch vertically and 72 dots per inch horizontally is considered good resolution, and produces a good, clear, image. Twice that number is known as high density, or high resolution. Half that number of dots per inch produces a grainy image.

The quality of print can also be measured by dots per line. A machine that prints 72 horizontal dots per inch with an 8″ line width would print 576 dots per line. So if it were printing a graphic from a video screen that had 320 horizontal pixels, the image on the paper would be approximately 5″ across. Dot-matrix printers usually print one dot per pixel. Through a process called dithering, the image can be expanded to occupy a larger area on the paper, but the resolution would not improve; like a photograph that was enlarged, the dots making up the picture would be more pronounced and obvious. On the other hand, if the density of the dots was 144 dots per inch, the graphics produced would be half the size.

You may also want to consider the speed with which the printer can print. Speed in the graphics mode is measured by dots per second or lines

Okidata's (Mt. Laurel, N.J.) Microline 93 impact dot-matrix printer was used to produce the condensed, emphasized, underlined, and proportionally spaced type at right. The Microline 93, along with the Microline 92, its companion printer, is shown in the photograph to the far right. Prices range from $449 to $1395.

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od buy. It's a great one. At a price that's ea
respondence quality printing and speed.  Add e
thout increasing  your costs. Great News! As f
40 cps, high resolution correspondence quality

nformation in its 136-column, 160 cps data  pr
to waiting.  The ML 93 also prints out 233 colu

----- To get more on a page, just condense your characters -----

int, no problem.  The ML 93 provides enhanced and emphas

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ibility, the ML 93 offers underlining, true de
haracter set, plus a downline loadable characte
r-to-character spacing to give you 'this spaci

sive Okigraph (TM)  dot-addressable  graphics
 to communicate effectively.
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per second. Both are usually proportional to the characters per second used to measure the speed of printers printing alphanumeric symbols; it is a measure of how fast the print head moves. In terms of characters per second, speeds of impact printers can range from 40 cps to about 400 cps, but increased speed may come at the expense of the density of the dots.

### Non-impact printing

Although we have said that impact printing is the most popular method for transferring graphics, non-impact dot-matrix printers are quickly gaining recognition for their capabilities. They can be used for graphics or text in much the same way that their impact relatives can, but no part of the print head ever touches the paper. Instead, the non-impact printers use ink jets, laser beams, thermal pins or electrosensitive technology to transfer patterns of dots without ever making contact with the paper.

In the personal-computer world, ink-jet printers are the most commonly used non-impact printers. Except for the print head, they work almost identically to impact dot-matrix printers. But instead of wires firing out to strike a ribbon, droplets of ink are sprayed or drawn onto the paper in the specified array.

Most ink-jet printers used with personal computers employ what is called drop-on-demand technology. A set of four, nine, 12 or more nozzles attached to an ink source are carried in the print head. The ink reservoir may also be carried in the print head or the ink could be supplied through a hose running from a supply at the side of the machine. At the tip of the nozzle is a small piezoelectric crystal that encircles it like a band. When the crystal is struck with a voltage of electricity, the crystal expands and then immediately contracts. The contraction causes a large change in the pressure, which forces out a drop of ink.

The most expensive ink-jet printers employ a continuous stream of ink. Nozzles carried in the print head are constantly spraying ink which is directed and deflected by an electron beam similar to the one used to illuminate a CRT.
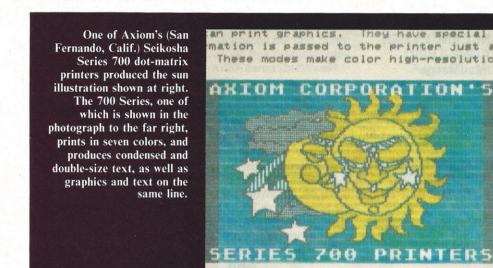
In another, less-used ink-jet technology known as spark jet, an electric source behind the paper attracts ink away from the ink cartridge. The ink source is hard instead of fluid, much like a pencil.

Ink-jet technology has a number of advantages over impact dot-matrix printers in producing graphics. Because the ink has a tendency to spread slightly when it hits the paper, the output looks a little smoother. It doesn't have the herringbone effect characteristic of impact printers. The colors are sprayed from separate nozzles, so they don't degrade over the lifetime of the ink supply, like a ribbon does. Ink-jet printers are fast, reliable, and very quiet. They also have a 100 percent duty cycle, meaning they can generally work all eight hours of a business day without problems.

But there are trade-offs with the ink-jet printers as well. The pastel-like colors produced tend to be less vivid than those made by a plotter, for example, which produces vibrant, coming-at-you colors with high contrast that you may want to have for an important presentation. (More on plotters later.)

An ink-jet printer will not use all types of paper, either. The ink will not be absorbed by glossy paper or transparencies (although most observers feel that advances in the technology will enable the ink-jet printers to handle transparencies by the end

*Non-impact printers use ink jets,*
*laser beams, and other means to*
*transfer patterns of dots onto paper.*

One of Axiom's (San Fernando, Calif.) Seikosha Series 700 dot-matrix printers produced the sun illustration shown at right. The 700 Series, one of which is shown in the photograph to the far right, prints in seven colors, and produces condensed and double-size text, as well as graphics and text on the same line.

of the year). The process works best on high-grade bond paper with a very smooth natural surface. If the surface is too rough, the ink spreads unevenly on the paper, diminishing the clarity and power of the graphics.

There is also the danger of the ink drying out. Different manufacturers employ different methods to reduce this possibility. In some machines, the nozzles are capped mechanically and pumped out mechanically before starting the printer for the day. Other makers rely on special ink based on ethyl glycol, the principal ingredient in antifreeze, to prevent the ink from congealing.

The speed and the resolution of an ink-jet printer are determined by the configuration of the print head. A minimum configuration for color graphics has one nozzle for each color: cyan, magenta, yellow and black. The more sophisticated the printer, the more nozzles it will have for each color. With a minimum configuration, an ink-jet printer may print as few as 60 or 70 dots per inch and 37 characters per second. The minimally configured ink-jet printer is so slow because it takes eight passes to print a single line. A printer with a bank of 12 nozzles could yield 120

dots per inch at 240 characters per second, producing graphics with very high resolution.

Ink-jet printers range in price from $699 for a minimum configuration to $5000 and up for a top-of-the-line, multicolor machine. Because they're so quiet, these printers are finding a welcome home in offices where employees want to be able to talk on the phone while the printer is operating.

### More non-impact printing

In addition to the ink-jet form of non-impact printing, there are other types of non-impact, dot-matrix printing: thermal and electrosensitive, which use specially treated paper to form impressions; and laser printing, which uses photosensitive material to form the image on paper.

In thermal printing, the matrix pins in the print head heat up, stimulating a reaction in the chemically coated paper. Although relatively inexpensive, thermal printing has not found a large market among business users—the chemical paper has the look and feel that photocopier paper had in the early days of that process, qualities which exclude it from use as a business media. The speed of a thermal printer is also restricted by

the speed of the chemical reactions in the paper; they generally print at a speed of about 30 characters per second.

Currently, thermal printers are often used as peripherals for low-end home computers, but because of their reliability, printer manufacturers have taken a second look at thermal technology. In a new approach, called thermal-transfer printing, the pins in the print head heat up, and the ink on the ribbon melts when the pins touch it. As the ribbon touches the paper, the impression is transferred. According to a spokesman for Toshiba America, where thermal-transfer technology will soon be featured in new products, thermal transfer printers can print at a speed of 500 cps, with resolution of 200 dots per inch. A typical thermal-transfer printer will be 14″ by 8″ by 20″, making it extremely portable. The printers will range in price from $2500 to $4500, and the special ribbons required for these machines will cost $27 each.

The second type of printing to use chemically treated paper, electrosensitive non-impact printing, has found a specialty niche in the marketplace—but once again, mass use is limited by paper quality. In this

process, the tungsten needles in the print head discharge small quantities of electricity. When the paper—which has been coated with a thin veneer of aluminum—is struck by the electricity, the aluminum is burned away, revealing an ink source.

Extremely high print speeds can be achieved by electrosensitive printers. They can be used in environmental conditions unsuitable for other types of printers, and in areas of high heat or humidity. Because the paper has been treated with aluminum, it is nearly indestructible, so many people use electrosensitive printing to create archival records which they hope to maintain for extended periods of time. Finally, electrosensitive paper has proven difficult to counterfeit. For that reason, many movie theaters use it to print tickets. Still, the aluminum-covered paper needed for electrosensitive printing makes this type of dot-matrix printing unsuitable for most business graphics.

Many observers feel, however, that laser printing could be the most common type of printing in the future. Using laser technology, you can attain what some would call letter-quality or better at very high speeds. In the second half of 1984, laser printing will dip in cost for the first time to under $15,000; some systems should even be available in the $3000 to $4000 range.

In many ways, laser printing emulates the dry imaging methods used in photocopying. A laser beam strikes a photosensitive material, generally on a drum, creating a latent image. As the drum passes close to the paper, powder is attracted by the latent image and transferred to the paper or transparencies.

Although the images are comprised of dots, laser printing does not use a matrix of dots. Even for text, the printer receives ASCII information from a personal computer and converts it into a graphics mode, building up images one line of dots at a time. Ironically, to print graphics,

the image processing requires additional capacity and a separate image processor controller.

Laser printing can render color by sending the paper through the process a number of times, and changing the color of the powder which adheres to the paper. Despite the clumsiness of that procedure, adherents of laser printing expect the technology to compete vigorously in the printer market. Like photocopiers, laser printers run quietly and can be easily serviced; the whole imaging system comes in a contained unit the operator can replace.

### What to look for in any printer

What we've given you is a good background—a basis for selecting which type of graphics output device is best for you. But there are other points to consider when investigating both impact and non-impact dot-matrix printers for use as graphics-output devices: You must check on software compatibility. Will the graphics program drive the machine you are interested in? Do you have to or can you purchase separate software or a circuit card to drive the machine? There's also the matter of computer compatibility. Do the necessary interfaces, serial or parallel, match? Do the baud rates, the speed at which the computer sends information to the printer and other devices, match? Be sure to ask the sales representative about these points.

To compare the different types of dot-matrix printers, you should look at the speed of the printer and the resolution of the image. Check the color capacity and the intensity of the colors produced. You also need to investigate what media the printer needs or can use.

Also, the way paper is fed into different machines varies. Tractor paper comes with holes punched on the side of the sheets which are looped on sprockets at the side of the machine. As the sprockets turn, the paper is pulled through the printer. Friction

feed puts paper through the printer in the same way that paper is fed through a typewriter, and has the same alignment problems. Can the printer accept single sheets, rolls, and fan-folded paper? What widths of paper can it use? Are you only going to use 8.5″ paper, or do you want to print on larger- and smaller-size media? Along with paper width, you have to learn the maximum line width the printer will print.

In addition, many of the high-quality dot-matrix printers come with options that will allow you to print with foreign character sets or even create your own character set. Is this an important feature for you?

After examining all of these things, you may decide that a dot-matrix printer—impact or non-impact—is not the solution to your graphics-output needs. You may feel you need higher resolution for your charts; you may want to reproduce line drawings for computer-aided design applications, or you may want to generate transparencies for use with an overhead projector during a business presentation or lecture. These days, only the very intrepid platform speaker will venture forth with no visual aids to buttress the spoken word.

You might consider using a plotter for these applications. Plotters can generate all the standard charts and graphs plus line drawings, flowcharts, and other complex patterns directly onto paper or transparencies. People are turning to plotters because of their outstanding line resolution, color quality, and flexibility in media selection.

Plotters are based on an entirely different technology than dot-matrix printers in the graphics mode. Instead of bit-mapping and screen dumping, a plotter will receive information from the computer, like "draw a circle with a 6″ diameter and color it red." The plotter's microprocessor will calculate the area of the circle, and move the drawing

media in accordance with the instructions.

There are three basic arrangements for plotters appropriate for personal computers: In one, the media is held in a flatbed tray and the pen, attached to an arm or bar, moves horizontally and vertically. Hewlett-Packard, the first entrant in the personal-computer plotter field and still the market leader, recently abandoned that approach in favor of a design in which the media is still held in a flatbed tray, but the tray moves in one direction and the pen moves at a right angle. The new construction, according to a company representative, allowed H-P to reduce the number of parts in the machine from more than 1000 to less than 200, increasing the reliability of the apparatus while shrinking the cost. In the third technique, the media—either paper or transparency film—is attached to a platen drum. Once again, the drum swivels in one direction while the pen moves in another.

### The first plotters

The first generation of plotters used only one or two pens. To change colors, the print arm would pause, and the operator would have to manually remove one pen and put in another. Although the switch could be accomplished in under five seconds, it required that a person stand around and monitor the device at all times.

The newer plotters use from four to eight pens, and are capable of changing colors automatically. The different pens are either carried on a turret attached to the print arm or stored in a corral at the edge of the plotter. In the first case, the colors are changed by a gear next to the paper bed. In the second, the arm returns one pen to the corral and brings out another.

The quality and accuracy of the graphics a plotter will produce is measured in two ways: addressable steps per inch and repeatability. Addressable steps per inch refers to how many points of color the plotter can

put down in a given area. Ratings generally fall between 500 and 1000 addressable steps per inch—the higher the number, the higher the resolution. You might also see this specification listed as a decimal, with 500 steps per inch equalling addressability of 0.05, and 1000 steps per inch equalling 0.001.

Repeatability indicates the ability of the arm to return a pen to the area on which it was just working. It's crucial for smooth circles and lines which close. Repeatability should have two rankings: one if you are using the same pen, and another if the pens have been changed. Once again, the lower the decimal number (possibly as low as 0.001 inch), the better the graphic.

Plotter speed is calculated in inches per second. It can range from 4″ per second to 15″ per second with the pen on the paper, and 20″ per second with the pen up. The speed rating can get confusing, however. Some companies calculate speed as the relationship of the pen to the paper. Their best rating comes when both the paper and the pen are moving. Other companies list speed as the maximum movement, either horizontally or vertically; in other words, when either the pen or the media is moving.

In analyzing the capacity of different machines, you should keep this in mind. But speed alone does not determine how fast a plot should be finished. The acceleration of the print arm and the paper also plays an important role. Consider a subcompact car and a Mack truck—both are capable of traveling at a speed of 60 miles per hour, but in neighborhood driving, the truck would never have a chance to reach 60 miles per hour because of its slow acceleration. Many of the operations a plotter performs, particularly lettering and numbering, are the equivalent of neighborhood driving. The pen must make a lot of turns, moving straight for only short periods of time. Accel-

eration in plotters is measured in units of g's, 1 g equaling the force of gravity. If speed is a requirement, look for a plotter with a speed of from 2 to 3 g's.

The difference in plot speed is readily observable. A slow plotter could take up to half an hour to complete a graph or chart that required a lot of alphanumeric information and had many solid areas, while a faster plotter could do the job in five to 10 minutes. When analyzing plotters, you should also compare the ease of use and the availability of supplies. How convenient is it to load the media and the pens? Do the pens leave stray marks, and are they capped automatically when not in use? If the pens are not capped, the ink may dry out well before the pen has achieved its rated life.

As with printers and other hard-copy output devices, check the different size and types of media the plotter can handle. Many plotters will accept paper or transparencies 1″ by 1″ or larger. Some can even operate with a continuous paper feed, which is very useful for plotting instrument readouts.

Historically, plotters have been quite expensive. However, machines suitable for the business environment now cost between $700 and $2000. Consequently, more and more companies, universities, scientific and engineering institutions, consultants, and professionals who must make presentations to clients are turning to plotters for the necessary graphics.

Many managers and businesses are enjoying the added impact given to their reports and presentations through the use of graphics on both paper and on transparencies.

If you have a dot-matrix printer and access to a photocopier, you can prepare graphics simply and cheaply. You just print out the graphic on your dot-matrix printer, and then photocopy it onto a transparency.

*(See chart next page)*

*Plotters produce vibrant, high contrast, coming-at-you colors suitable for presentations.*

# Some Representative Hard-copy Hardware Manufacturers

## Plotters

Alpha Merics Corp.
20931 Nordhoff St.
Chatsworth, CA 91311
(213) 709-1155

Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL
60007
(312) 364-1180

Apple Computer Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

Atari, Inc.
1265 Borregas Ave.
Sunnyvale, CA 94086
(408) 745-2000

Cal Comp
2411 West La Palma Ave.
Anaheim, CA 92803
(714) 821-2011

Comrex Int'l.
3701 Skypark Dr.
Suite 120
Torrance, CA 90505
(213) 373-0280

Enter Computer
6867 Nancy Ridge Dr.
Suite D
San Diego, CA 92121
(619) 450-0601

Hewlett Packard
Personal Computer
Group
974 E. Arques Ave.
Sunnyvale, CA 94088-
3486
(408) 720-3000

Houston Instrument
8500 Cameron Rd.
Austin, TX 78753
(512) 835-0900

Radio Shack/Tandy
Corp.
1400 One Tandy Center

Fort Worth, TX 76102
(817) 390-3011

Roland DG
7200 Dominion Circle
Los Angeles, CA 90040
(213) 685-5141

Strobe, Inc.
897-5A Independence
Ave.
Mountain View, CA
94043
(415) 969-5130

## Electrosensitive Printers

Apple Computer Inc.
20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010

Axiom Corp.
1014 Griswold Ave.
San Fernando, CA 91340
(213) 365-9521

## Impact Dot-Matrix with Graphics

Anacom General
1116 East Valencia Dr.
Fullerton, CA 92631
(714) 992-0223

Anadex, Inc.
9825 De Soto Ave.
Chatsworth, CA 91311
(213) 998-8010

Apple Computer Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

Atari, Inc.
1265 Borregas Ave.
Sunnyvale, CA 94086
(408) 745-2000

Axiom Corp.
1014 Griswold Ave.
San Fernando, CA 91340
(213) 365-9521

Canon U.S.A., Inc.
Systems Division

One Canon Plaza
Lake Success, NY 11042
(516) 488-6700

Centronics Data
Computer Corp.
1 Wall St.
Hudson, NH 03051
(603) 883-0111

C. Itoh
5301 Beethoven St.
Los Angeles, CA 90066
(213) 306-6700

Commodore Business
Machines
1200 Wilson Dr.
Westchester, PA 19380
(215) 431-9100

Data Impact Products
745 Atlantic Ave.
Boston, MA 02111
(617) 482-4214

Dataproducts Corp.
6200 Canoga Ave.
Woodland Hills, CA 91365
(213) 887-8000

Datasouth
4216 Stuart Andrew Blvd.
Charlotte, NC 28210
(704) 523-8500

Digital Equipment Corp.
146 Main St.
Maynard, MA 01754
(617) 897-5111

Dynax, Inc.
5698 Bandini Blvd.
Bell, CA 90201
(213) 260-7121

Epson America, Inc.
3415 Kashiwa St.
Torrance, CA 90505
(213) 539-9140

Facit Inc.
235 Main Dunstable Rd.
Caller Service 2020

Nashua, NH 03061
(603) 883-4157

Genicom
(formerly General Electric
Data Communications
Products Department)
One General Electric Dr.
Waynesboro, VA 22980
(703) 949-1000

Heath/Zenith Co.
P.O. Box 1288
Benton Harbor, MI 49022
(616) 982-3417

Hewlett Packard
Personal Computer
Group
974 E. Arques Ave.
Sunnyvale, CA 94088-
3486
(408) 720-3000

Hi-G Printers Corp.
101 Locust St.
Hartford, CT 06114
(203) 522-8600

IBM Corp.
Customer Relations
P.O. Box 1328
Boca Raton, FL 33432
(305) 998-2000

Infoscribe Inc.
2720 South Croddy Way
Santa Ana, CA 92704
(714) 641-8595

Lear Siegler, Inc.
Data Products Division
714 North Brookhurst St.
Anaheim, CA 92803
(800) 854-3805

Mannesmann Tally
8301 S. 180th St.
Kent, WA 98032
(206) 251-5524

Micro Peripherals, Inc.
4426 South Century Dr.

*Some industry observers feel that business graphics could be the next new wave to engulf personal computing.*

## Some Representative Hard-copy Hardware Manufacturers (continued)

Salt Lake City, UT 84123
(801) 263-3081

Mindware Inc.
15 Tech Circle
Natick, MA 01760
(617) 655-2824

NEC Home Electronics
(U.S.A.), Inc.
1401 Estes Ave.
Elk Grove Village, IL
60007
(312) 228-5900

North Atlantic/Quantex
60 Plant Ave.
Hauppauge, NY 11788
(516) 582-6060

Okidata
532 Fellowship Rd.
Mt. Laurel, NJ 08054
(609) 235-2600

Panasonic Industrial
One Panasonic Way
Secaucus, NJ 07094
(201) 348-5330

Personal Micro
Computers
475 Ellis St.
Mountain View, CA
94043
(415) 962-0220

Printek
1517 Townline Rd.
Benton Harbor, MI 49022
(616) 925-3200

Printronix, Inc.
17500 Cartwright Rd.
P.O. Box 19559
Irvine, CA 92713
(714) 549-7700

Radio Shack/Tandy
Corp.
1400 One Tandy Center
Fort Worth, TX 76102
(817) 390-3011

Star Micronics Inc.
888 Washington St.
Suite 311
Dedham, MA 02026
(617) 329-8560

Texas Instruments
P.O. Box 402430
Dallas, TX 75240
(214) 995-2011

Toshiba America, Inc.
2441 Michelle Dr.
Tustin, CA 92680
(714) 730-5000

Transtar
P.O. Box C-96975
Bellevue, WA 98009
(206) 454-9250

Trilog, Inc.
17391 Murphy Ave.
Irvine, CA 92714
(714) 863-3033

### Ink-Jet Printers

Advanced Color
Technology
21 Alpha Rd.
Chelmsford, MA 01824
(617) 256-1222

Canon U.S.A., Inc.
Systems Division
One Canon Plaza
Lake Success, NY 11042
(516) 488-6700

Diablo
A Xerox Company
P.O. Box 5030
Fremont, CA 94537
(415) 786-5000

Docutel/Olivetti
Information Services
106 Decker, Suite 300
Irving, TX 75206
(214) 258-8610

Ope Printers, Inc.
505 White Plains Rd.
Tarrytown, NY 10591
(914) 631-3000

PrintaColor Corp.
5965 Peachtree Corners
East
Norcross, GA 30071
(404) 448-2675

Quadram Corp.
4355 International Blvd.
Norcross, GA 30093
(404) 923-6666

Sharp Electronics Corp.
(I.E.D. Systems Div.)
10 Sharp Plaza
Paramus, NJ 07652
(201) 265-5600

Siemens Communication
Systems, Inc.
5500 Broken Sound Blvd.
Boca Raton, FL 33431
(305) 994-8800

Radio Shack/Tandy
Corp.
1400 One Tandy Center
Fort Worth, TX 76102
(817) 390-3011

### Laser Printers

Canon U.S.A., Inc.
Systems Division
One Canon Plaza
Lake Success, NY 11042
(516) 488-6700

### Thermal Printers

Alphacom
2323 South Bascom Ave.
Campbell, CA 95008
(408) 559-8000

Axiom Corp.
1014 Griswold Ave.
San Fernando, CA 91340
(213) 365-9521

Trendcom/3M Business
Communication Products
Division
480 Oakmead Pkwy.
Sunnyvale, CA 94086
(800) 538-8157
(800) 672-3470 in CA

### Thermal Transfer

Toshiba America, Inc.
2441 Michelle Dr.
Tustin, CA 92680
(714) 730-5000

### Photographic Image Makers

Celtic Technology
6265 Variel Ave.
Woodland Hills, CA 91367
(213) 884-6767

Dunn Instruments
P.O. Box 77172
544 Second St.
San Francisco, CA 94107
(415) 957-1600

Eastman Kodak Co.
343 State St.
Rochester, NY 14650
(716) 724-4000

Image Resource
2260 Townsgate Rd.
Westlake Village, CA
91361
(805) 496-3317

Lang Systems, Inc.
1010 O'Brien Dr.
Menlo Park, CA 94025
(415) 328-5555

Matrix Instruments
230 Pegasus Ave.
Northvale, NJ 07647
(201) 767-1750

Modgraph Inc.
1393 Main St.
Waltham, MA 02154
(617) 890-5764

Polaroid Corp.
Industrial Marketing Dept.
575 Technology Square
Cambridge, MA 02139
(617) 577-2000

# BUYER'S GUIDE TO HARD COPY GRAPHICS

| COMPANY/PRODUCT | SYSTEMS | PRICE | TYPE | PLOTTER PEN | # COLORS PRODUCED | ILLUSTRATIONS FOR OVERHEAD |
|---|---|---|---|---|---|---|
| **ADVANCED COLOR TECHNOLOGY** | | | | | | |
| Chromajet Act II Series | Zenith; IBM PC; APL II, II+, IIe | $6400 | IJP | N/A | 125 | Yes |
| **ALPHACOM** | | | | | | |
| 42 | MPC | $100-$120 | TP | N/A | B/W | No |
| 81 | MPC | $211-$226 | TP | N/A | B/W | No |
| **ALPHA MERICS** | | | | | | |
| Alpha plot 1 (size C) | MPC | $4590 | PL | Fiber; felt | One color at a | Yes |
| Alpha plot 2 (size D) | MPC | $5590 | PL | technical; broad; | time | |
| Datascribe IV | MPC | $9500 | PL | fine | | |
| **AMDEK** | | | | | | |
| DXY-100 Digital Plotter | IBM; ATA 400, 800, 1200; APL II, II+, IIe | $749 | PL | Felt | One color at a time | Yes |
| **ANACOM GENERAL** | | | | | | |
| 150 (80 col) | MPC | $1420 | DMP | N/A | B/W | No |
| 150 (132 col) | MPC | $1495 | DMP | N/A | B/W | No |
| 150Z (80 col) | MPC | $1820 | DMP | N/A | B/W | No |
| 150Z (132 col) | MPC | $1895 | DMP | N/A | B/W | No |
| 160 (80 col) | MPC | $1675 | DMP | N/A | B/W | No |
| 160 (132 col) | MPC | $1750 | DMP | N/A | B/W | No |
| 160Z (80 col) | MPC | $2075 | DMP | N/A | B/W | No |
| 160Z (132 col) | MPC | $2150 | DMP | N/A | B/W | No |
| **ANADEX** | | | | | | |
| DP 9000A Printer | MPC | $1625 | DMP | N/A | B/W | No |
| DP 9001A Printer | MPC | $1625 | DMP | N/A | B/W | No |
| DP 9500A Printer | MPC | $1725 | DMP | N/A | B/W | No |
| DP 9501A Printer | MPC | $1725 | DMP | N/A | B/W | No |
| DP 9620A Printer | MPC | $1845 | DMP | N/A | B/W | No |
| DP 9625A Printer | MPC | $1995 | DMP | N/A | B/W | No |
| DP 9725 A Printer | MPC | $2350 | DMP | N/A | 4 | No |
| WP 6000 Printer | MPC | $2700 | DMP | N/A | B/W | No |
| DP 6500 Printer | MPC | $2995 | DMP | N/A | B/W | No |
| **APPLE** | | | | | | |
| Imagewriter | APL II, II+, IIe; Macintosh; Lisa | $499 | DMP | N/A | B/W | No |
| Color plotter | APL II, II+, IIe; Lisa | $995 | PL | Felt | 8 | Yes |
| Silentype | APL IIe | $295 | TP | N/A | B/W | No |
| Silentype | APL III | $350 | TP | N/A | B/W | No |
| **ATARI** | | | | | | |
| 1025 Dot Matrix Printer | ATA 800 | $549.95 | DMP | N/A | B/W | No |
| 1020 Dot Matrix Printer | ATA 800 | $299 | DMP | N/A | 4 | No |
| 1027 Printer | ATA 800 | $349.95 | LQP | N/A | B/W | No |
| **AXIOM** | | | | | | |
| GP-100A Printer | MPC | $299 | DMP | N/A | B/W | No |
| GP-250A Printer | MPC | $339 | DMP | N/A | B/W | No |
| GP-550 Printer | MPC | about $400 | DMP | N/A | B/W | No |
| GP-700 Printer | MPC | about $500 | DMP | N/A | 7 | Yes |
| AT 100 Printer (ATA direct connect) | ATA 400, 800, 1200 | $299 | DMP | N/A | B/W | No |
| CD 100 Printer (COM direct connect) | COM 64 | $299 | DMP | N/A | B/W | No |
| **BAUSCH & LOMB** (see Houston Instruments) | | | | | | |
| CPS (series of 6) | MPC | $39.95-$13,950 | PL | Ballpoint; felt; graphing pen | 4 | Yes |
| High Plot plotters | MPC | $995-$3275 | PL | Ballpoint; felt; graphing pen | 4 | Yes |
| **BMC USA** | | | | | | |
| PB 101 | APC | $1100 | DMP | N/A | B/W | No |
| PB 401 | APC | $849 | DMP | N/A | B/W | No |
| BX 80 | APC | $380 | DMP | N/A | B/W | No |
| XY Plotter | APC | $999 | PL | Felt, water base, oil base | 4 | Yes |
| **CAL COMP** | | | | | | |
| M84 | MPC | $2000 | PL | Ballpoint; felt | 8 | Yes |
| **CANON USA** | | | | | | |
| PW-1080A | MPC | $595 | DMP | N/A | B/W | No |
| PW-1156A | MPC | $895 | DMP | N/A | B/W | No |
| PJ-1080A | MPC | $795 | IJP | N/A | 7 | Yes |
| **CELTIC TECHNOLOGY** | | | | | | |
| VFR 2000 | MPC | $2500 | CAM | N/A | Depends on host computer | 35mm |
| **CENTRONICS DATA COMPUTER** | | | | | | |
| 122 Graphics | APC | $995 | DMP | N/A | B/W | No |
| Print Station Model 358 | APC | $3395 | DMP | N/A | 7 | No |

| SYSTEMS | | | |
|---|---|---|---|
| APPLE-APL | ITHACA-ITH | VICTOR-VR | THERMAL PRINTER-TP |
| ATARI-ATA | LEAR SIEGLER-LS | WANG-W | PLOTTER-PL |
| COMMODORE-COM | NORTHSTAR ADVANTAGE-NS ADV | ALL PERSONAL COMPUTERS-APC | CAMERA-CAM |
| CORVUS-COR | NORTHSTAR HORIZON-NSH | MOST PERSONAL COMPUTERS-MPC | COLOR GRAPHICS ADAPTOR-CGA |
| DEC-DEC | OSBORNE-OSB | STANDS ALONE-SA | COLOR PROJECTOR-PRO |
| EPSON-EPS | QUASAR-Q | PRINTER-P | GRAPHICS BOARD-GB |
| HEATH-ZENITH-HZ | RADIO SHACK-TRS | COLOR PRINTER-CP | GRAPH INTERFACE-GI |
| HEWLETT-PACKARD-HP | SDI SUPER DAZZLER-SDI | DOT-MATRIX PRINTER-DMP | GRAPHICS TERMINAL-GT |
| IBM-IBM | VECTOR GRAPHIC-VG | JET-INK PRINTER-IJP | TABLET-TAB |
| | VENA-VE | LETTER-QUALITY PRINTER-LQP | |

# WITH THE PASSWORD™ MODEM AND TELPAC™ PAUL REVERE COULD HAVE WARNED 14 VILLAGES IN 40 WINKS.

The Password™ modem and Telpac™ software can distribute an urgent message to 14 points – automatically. By saving time, work, *and* money, they are just as valuable for longer, less urgent messages. Another revolutionary example: They can transmit a text the length of the Declaration of Independence in a little more than a minute, while you sleep, when long distance rates are lowest.

And when you work with Telpac, you will find it typically USR friendly.

To do all this, team Telpac with your computer and with Password, the USR modem so advanced you just turn it on. Auto dial/answer, 300/1200 baud, and a two-year limited warranty for $449.* Write or call for complete descriptions – both Telpac and Password do far more than this!

**U.S. ROBOTICS INC.**
1123 WEST WASHINGTON · CHICAGO, ILLINOIS 60607
(312) 733-0497

CIRCLE 137

*Suggested list for Password complete with power adapter, phone cable, RS232 interface. Telpac software, $79.

Password, Telpac, and USR logo are trademarks of U.S. Robotics Inc.

| COMPANY/PRODUCT | SYSTEMS | PRICE | TYPE | PLOTTER PEN | # COLORS PRODUCED | ILLUSTRATIONS FOR OVERHEAD |
|---|---|---|---|---|---|---|
| **CIE TERMINALS** | | | | | | |
| CI 300 | APC | $4495 | DMP | N/A | B/W | No |
| CI 600 | APC | $5995 | DMP | N/A | B/W | No |
| **COMMODORE COMPUTER** | | | | | | |
| 1520 Printer/Plotter | COM 64, VIC 20 | $200 | DMP/PL | Ballpoint | 4 | Yes |
| **COMREX INTERNATIONAL** | | | | | | |
| Comscriber | MPC | $695 | PL | Felt | 12 | Yes |
| **CROMEMCO** | | | | | | |
| Super Dazzler | Any S-100 | $795 | Graphics Interface board | N/A | Up to 4096 | Yes |
| **C.ITOH** | | | | | | |
| Prowriter 8510 | MPC | $795 | DMP | N/A | B/W | No |
| Prowriter 1550 | MPC | $995 | DMP | N/A | B/W | No |
| Prowriter 8510 S | MPC | $825 | DMP | N/A | B/W | No |
| Prowriter 1550 S | MPC | $1225 | DMP | N/A | B/W | No |
| Prowriter 8510 SC | MPC | $925 | DMP | N/A | 7 | No |
| Prowriter 1550 SC | MPC | $1325 | DMP | N/A | 7 | No |
| **DATA IMPACT PRODUCTS** | | | | | | |
| DIP 84G | MPC | $225 | DMP | N/A | B/W | No |
| DIP 92 | MPC | $399 | DMP | N/A | B/W | No |
| **DATAPRODUCTS** | | | | | | |
| Pinnacle 8010 | APC | $649 | DMP | N/A | B/W | No |
| Pinnacle 8060 | APC | $1499 | DMP | N/A | 7 | No |
| P-80 | APC | $1299 | DMP | N/A | 7 | No |
| P-132 | APC | $1499 | DMP | N/A | 7 | No |
| **DATASOUTH** | | | | | | |
| DS 108 | MPC | $1595 | DMP | N/A | B/W | No |
| DS 220 | MPC | $1995 | DMP | N/A | B/W | No |
| **DIABLO** | | | | | | |
| Series C | MPC | $1250 | IJP | N/A | 7, Shadings | Yes |
| **DIGITAL EQUIPMENT** | | | | | | |
| Letter Printer 100 | MPC | $1595 | LQP | N/A | B/W | No |
| **DOCUTEL/OLIVETTI INFORMATION SERVICES** | | | | | | |
| PR 2300 | MPC | $409 | IJP | N/A | B/W | Yes |
| **DUNN INSTRUMENTS** | | | | | | |
| Microcolor | SA | $4000 | CAM | N/A | N/A | Yes |
| Compactcolor | SA | $13,000 | CAM | N/A | N/A | Yes |
| Versacolor | SA | $14,000-$16,000 | CAM | N/A | N/A | Yes |
| Procolor SD | SA | $24,000 | CAM | N/A | N/A | Yes |
| Procolor SS | SA | $30,000 | CAM | N/A | N/A | Yes |
| **DYNAX** | | | | | | |
| HR 1 | IBM PC; APL II, IIe, II+ | $818 | LQ | N/A | B/W | No |
| HR 25 | IBM PC; APL II, IIe, II+ | $995 | LQ | N/A | Red and Black | No |
| DX 15 | IBM PC; APL II, IIe, II+ | $599 | LQ | N/A | B/W | No |
| **EASTMAN KODAK** | | | | | | |
| Instagraphic CRT | MPC | $190 | CAM | N/A | N/A | 35mm |
| **ELECTROHOME ELECTRONICS** | | | | | | |
| ECP 1000 | MPC | $15,000 | PRO | N/A | N/A | Yes |
| EDP 57 | MPC | $4800 | PRO | N/A | N/A | Yes |
| **ENTER COMPUTER** | | | | | | |
| Model 100 | MPC | $795 | PL | Fiber; Felt | One at a time | Yes |
| Six-shooter | MPC | $1095 | PL | Fiber; Felt | Six at a time | Yes |
| **ENVISION** | | | | | | |
| Envision 420 | APC | $4450 | DMP | N/A | 4 | No |
| Envision Vector 430 | APC | $5450 | DMP | N/A | 4 | No |
| **EPSON AMERICA** | | | | | | |
| MX 80 FT | APC | $699 | DMP | N/A | B/W | No |
| MX 100 | APC | $895 | DMP | N/A | B/W | No |
| RX 80 | APC | $499 | DMP | N/A | B/W | No |
| FX 80 | APC | $699 | DMP | N/A | B/W | No |
| FX 100 | APC | $845 | DMP | N/A | B/W | No |
| **FACIT DATA PRODUCTS** | | | | | | |
| Facit 4510 | MPC | $695 | DMP | N/A | B/W | Yes |
| Facit 4512 | MPC | $1195 | DMP | N/A | B/W | Yes |
| Facit 5000 C | MPC | $1695 | DMP | N/A | B/W | Yes |
| Facit 5000 V | MPC | $2195 | DMP | N/A | B/W | Yes |
| Facit 4542 | MPC | $3395 | DMP | N/A | 2 | Yes |
| Facit 4544 | MPC | $4695 | DMP | N/A | 8 up | Yes |
| Facit 4570 | MPC | $3295 | DMP | N/A | B/W | Yes |
| **GENICOM** | | | | | | |
| 3014 | MPC | $1195 | DMP | N/A | B/W | No |
| 3024 | MPC | $1395 | DMP | N/A | B/W | No |
| **HEATH/ZENITH** | | | | | | |
| H 125 | MPC | $899 | DMP | N/A | B/W | No |
| **HEWLETT PACKARD** | | | | | | |
| 7470 Plotter | APL II; IBM PC; HP | $1575 | PL | Felt; fiber tip | 12 up | Yes |
| 9111A Tablet | APL II; IBM PC; HP | $2275 | TAB | Felt; fiber tip | 12 up | Yes |
| **HITACHI AMERICA** | | | | | | |
| Tiger Tablet | APC | $743 | TAB | N/A | Infinite | Yes |
| **HOUSTON INSTRUMENTS** | | | | | | |
| Hiplot DMP-29 | APC | $2295 | PL | Ballpoint; felt; technical pen | 8 | Yes |

*Many high-quality dot-matrix printers come with options which allow you to print with foreign character sets.*

| COMPANY/PRODUCT | SYSTEMS | PRICE | TYPE | PLOTTER PEN | # COLORS PRODUCED | ILLUSTRATIONS FOR OVERHEAD |
|---|---|---|---|---|---|---|
| IBM | | | | | | |
| Graphics | IBM PC, XT | $595 | DMP | N/A | B/W | No |
| Compact Printer | IBM PC, XT | $175 | DMP | N/A | B/W | No |
| IMAGE RESOURCE | | | | | | |
| Videoprint 5000 | MPC (Uses RGB signal) | $6000 | CAM | N/A | N/A | 35mm, 4×5, SX-70 |
| Videoprint Model 4 | MPC (Uses RGB signal) | $6000 | CAM | N/A | N/A | 35mm, 4×5, SX-70 |
| Videoprint Model 8 | MPC (Uses RGB signal) | $6000 | CAM | N/A | N/A | 35mm, 4×5, SX-70 8×10 |
| INFOSCRIBE | | | | | | |
| Infoscribe 1000 | APC | $1895 | DMP | N/A | B/W | No |
| Infoscribe 1200 | APC | $2495 | DMP | N/A | 4 | No |
| INTERGRAL DATA SYSTEMS | | | | | | |
| Prism Printer 80 | APC | $1299 | DMP | N/A | 8 | No |
| Prism Printer 132 | APC | $1499 | DMP | N/A | 8 | No |
| Micro Prism | APC | $649 | DMP | N/A | B/W | No |
| INTERACTIVE STRUCTURES | | | | | | |
| PKASO | MPC | $175 | GB | N/A | 16 | Yes, depending on printer and paper used |
| ITHACA INTERSYSTEMS | | | | | | |
| Graphos | ITH | $7995 | GT | N/A | 32,768 | Yes |
| LANG SYSTEMS | | | | | | |
| Video slide 35 | APC | $2800-$3500 | CAM | N/A | N/A | 35mm, SX-70 |
| LEAR SIEGLER | | | | | | |
| Vector Drawing Graphics Board | LS | $1050 | GB | N/A | B/W | No |
| Versa Print 500 Series | LS | $1695 up | DMP | N/A | B/W | No |
| MANNESMANN TALLY | | | | | | |
| MT 160 | MPC | $698-$798 | DMP | N/A | B/W | No |
| PIXY 3 | MPC | $795 | PL | Felt; fiber tip; custom to the plotter | 8 | Yes |
| MATRIX INSTRUMENTS | | | | | | |
| 3000 Film Recorder | MPC | $10,000 | CAM | N/A | N/A | 35mm, Sheet, Polaroid, 16mm |
| 4007 Film Recorder | MPC | $20,000 | CAM | N/A | N/A | 35mm, Sheet, Polaroid, 16mm |
| MICRO CONTROL SYSTEMS | | | | | | |
| Space Tablet | IBM PC | $795 (incl. Space Graphics Software) | TAB | N/A | Depends on monitor | Yes |
| MICRO PERIPHERALS | | | | | | |
| Printmate 150 | APC | $995-$1345 | DMP | N/A | Shadings | No |
| Model 99 | APC | $599 | DMP | N/A | Shadings | No |
| TELEGRAPHICS CAMERA | | | | | | |
| MFR-8 | MPC | $8000 | CAM | N/A | N/A | 35mm, Sheet, Polaroid |
| MFR-8H (highline) | MPC | $10,000 | CAM | N/A | N/A | 35mm, Sheet, Polaroid |
| NEC HOME ELECTRONICS USA | | | | | | |
| 8023 A Printer | APC | $645 | DMP | N/A | Depends on software | Yes |
| PC 6021 | NEC | | | | | |
| Thermal Printer | PC 6000 | $249.95 | TP | N/A | B/W | No |
| NEC INFORMATION NORTH ATLANTIC/QUANTEX | | | | | | |
| 7020 | APC | $1495 | DMP | N/A | B/W | No |
| 7030 | APC | $1695 | DMP | N/A | B/W | No |
| 7040 | APC | $1795 | DMP | N/A | B/W | No |
| 7065 | APC | $1995 | DMP | N/A | B/W | No |
| OKIDATA | | | | | | |
| Microline Series | MPC | $449-$1395 | DMP | N/A | B/W | Yes |
| OPE PRINTERS | | | | | | |
| JP101 | MPC | $400 | IJP | N/A | B/W | No |
| ORANGE MICRO | | | | | | |
| Grappler+ | APL II, II+, IIe, III | $175 | GI | N/A | B/W | Determined by printer |
| Buffered Grappler+ | APL II, II+, IIe | $239 | GI | N/A | B/W | Determined by printer |
| IDS Grappler+ | APL II, II+, IIe; IBM PC | $175 | GI | N/A | Determined by printer | Determined by printer |
| PANASONIC | | | | | | |
| VP 6801 A | APL II, II+, IIe; IBM PC | $1995 | PL | Waterbase fiber; plastic, ballpoint; oil base fiber | 6 | Yes |
| KXP 1090 | APL II, II+, IIe; IBM PC | $499 | DMP | N/A | B/W | No |
| KXP 1160 | APL II, II+, IIe; IBM PC | $1750 | DMP | N/A | B/W | No |
| POLAROID | | | | | | |
| Palette | APL II, II+, IIe; IBM PC | $1500 | CAM | N/A | 72 | 35mm, Polaroid |
| PRINTACOLOR | | | | | | |
| Printacolor PG-1000 | APL II, III; IBM PC | $3295 | DMP | N/A | 125 | Yes |
| PRINTEK | | | | | | |
| 910 | APC | $1595 | DMP | N/A | B/W | No |
| 920 | APC | $2395 | DMP | N/A | B/W | No |
| 930 | APC | $1995 | DMP | N/A | B/W | No |
| PRINTRONIX | | | | | | |
| MVP 150B | IBM PC, VIC 9000 | $3700 | DMP | N/A | B/W | No |
| QUADRAM | | | | | | |
| Quadjet | MPC | $895 | IJP | N/A | 7 | No |

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CIRCLE 190

*Plotters can generate charts, graphs, line drawings, flowcharts, and other patterns onto paper or transparencies.*

| COMPANY/PRODUCT | SYSTEMS | PRICE | TYPE | PLOTTER PEN | # COLORS PRODUCED | ILLUSTRATIONS FOR OVERHEAD |
|---|---|---|---|---|---|---|
| QUANTEX | | | | | | |
| 7030 | APC | $1995 | DMP | N/A | B/W | Yes |
| 7040 | APC | $2195 | DMP | N/A | B/W | Yes |
| QUME | | | | | | |
| Sprint II Plus Daisy-Wheel Printer | APC | $1776 | LQP | N/A | B/W | Yes |
| RADIO SHACK/TANDY CORP. | | | | | | |
| DMP 100 | APC | $399 | DMP | N/A | B/W | No |
| DMP 200 | APC | $699 | DMP | N/A | B/W | No |
| DMP 420 | APC | $999 | DMP | N/A | B/W | No |
| DMP 500 | APC | $1295 | DMP | N/A | B/W | No |
| DMP 120 | APC | $499.95 | DMP | N/A | B/W | No |
| CGP 115 Plotter-Printer | APC | $199.95 | PL/PR | Ballpoint; felt | 4 | No |
| CGP 220 Plotter-Printer | APC | $699 | PL/PR | Fiber tip; felt | 7 | No |
| FP 215 Plotter | APC | $995 | PL | Fiber tip; felt | 4 | No |
| ROLAND DG | | | | | | |
| DXY800 | MPC | $995 | PL | Felt | 8 | Yes |
| DXY101 | MPC | $750 | PL | Felt | 1 | Yes |
| SIEMENS COMMUNICATION SYSTEMS | | | | | | |
| PT-88 | APC | $895 | IJP | N/A | B/W | No |
| PT-89 | APC | $1149 | IJP | N/A | B/W | No |
| 2712 | APC | $2025-$2250 | IJP | N/A | B/W | No |
| SOLTEC | | | | | | |
| Model 6801 (DINA 4) | MPC | $1995 | PL | Ballpoint; felt; technical pen | 6 | Yes |
| Model 6802 (DINA 3) | MPC | $2595 | PL | Ballpoint; felt; technical pen | 8 | Yes |
| RY-10M (DINA 3) | MPC | $1995 | PL | Ballpoint; felt; technical pen | 8 | Yes |
| RY-1M (DINA 4) | MPC | $1595 | PL | Ballpoint; felt; technical pen | 6 | Yes |
| STAR MICRONICS | | | | | | |
| Gemini 10X | MPC | $399 | DMP | N/A | B/W | Yes |
| Gemini 15X | MPC | $549 | DMP | N/A | B/W | Yes |
| SPX 80 | MPC | $199 | TP | N/A | B/W | Yes |
| STROBE | | | | | | |
| M 100 | MPC | $595 (incl. interface) | PL | Any pen | 1 | Yes |
| M 200 | MPC | $695 (incl. interface and software) | PL | Any pen | 1 | Yes |
| M 260 | MPC | $995 | PL | Specially designed pens (available from Strobe) | 8 | Yes |
| TEXAS INSTRUMENTS | | | | | | |
| 850 | MPC | $595-$660 | DMP | N/A | B/W | No |
| 855 | MPC | $935-$995 | DMP | N/A | B/W | No |
| TOSHIBA AMERICA | | | | | | |
| 1350 | MPC | $2195 | DMP | N/A | B/W | No |
| TRANSTAR | | | | | | |
| 315/FC | APL II; IBM PC | $599 | DMP | N/A | 7 | Yes |
| TRENDCOM/3M BUSINESS COMMUNICATION PRODUCTS DIVISION | | | | | | |
| Whisper Printer 1902 | MPC | $259 | DMP | N/A | B/W | No |
| Whisper Printer 1912 | MPC | $299 | DMP | N/A | B/W | No |
| Whisper Printer 1904 | MPC | $249 | DMP | N/A | B/W | No |
| Whisper Printer 1914 | MPC | $289 | DMP | N/A | B/W | No |
| TRILOG | | | | | | |
| TIP-150 | APC | $3900 | DMP | N/A | B/W | No |
| TIP-300 | APC | $4900 | DMP | N/A | B/W | No |
| TIP-301 | APC | $5900 | DMP | N/A | B/W | No |
| TIP-302 | APC | $6900 | DMP | N/A | 256 | No |
| VECTRIX | | | | | | |
| VX 128 | APC | $2495 | GB | N/A | 8 | Yes |
| VX 384 | APC | $4295 | GB | N/A | 512 | Yes |
| YOKOGAWA | | | | | | |
| PL-1000 | MPC | $1200 | PL | Plastic tip | 4 | Yes |
| PL-2000 | MPC | $2000 | PL | Fiber tip; ceramic tip; drafting pen | 4 | Yes |
| Graphmate II | SA | $2800 | PL | Fiber tip; ceramic tip; drafting pen | 4 | Yes |

# Choosing The Right Stuff

*If you have questions dealing with hardware, software, or applications, Personal Computing will answer them in this monthly column. Please send your 'need-to-knows' to: Answers, Personal Computing, 10 Mulholland Drive, Hasbrouck Heights, New Jersey 07604.*

**Q: What's the best personal computer to buy for business applications?**

**A:** This is truly a question with a hundred answers (if not more), depending on who you talk to. We talked to Dave McKnelly, who manages the Dover, Del., Computer-Land store and sells Apple, Compaq, Digital, and IBM computers, and here's the answer we got.

McKnelly sells the Apple IIe for education, home, and small business applications, and if the small business isn't so small, he recommends the Apple III. However, "right now," he says, "the Compaq or the Digital would be able to go further in a larger business application because of the expandability of the systems—the amount of memory and hard disk capacity that can be added to the systems. You could say that they are in the small-to-medium business range, while the Apple III is more toward the small business range."

According to McKnelly, a typical Apple III buyer would be somebody like a high school principal, who would use the computer to keep track of his budget and student attendance, and maybe even to do some word processing. He might even have a hard disk with it.

The Compaq, McKnelly says, is similar to an IBM or even a Digital system. Accounting people, business managers, professional word-processing people, and software developers are potential customers of these machines. Those who go with a Compaq would be particularly interested in cost-effectiveness.

Then there's the IBM. McKnelly feels a lot of people buy IBM because of the name. He likes the computer, but he observes some people who buy it who would be served just as well, if not better, by other machines. Someone might really benefit from the portability of a machine like the Compaq, yet insist on IBM's "name."

McKnelly points out that people who travel in their work—sales professionals and consultants—are especially happy with the Compaq. Even those who *don't* move the computer appreciate its modest demands on office space. This is also true of the Digital computers, if you have room for the bulk of the system beside your desk, where you put all of the computer except the terminal.

McKnelly says software developers and professionals often use the Digital, especially if they have Digital minicomputers. A Digital Professional series buyer would be a company executive who needs a high-powered system.

Finally, McKnelly observes that while each system has its own unique merits, most business-applications users could resolve the question of which machine to buy by first answering the questions, "which applications do I have" and "which software will I need?"
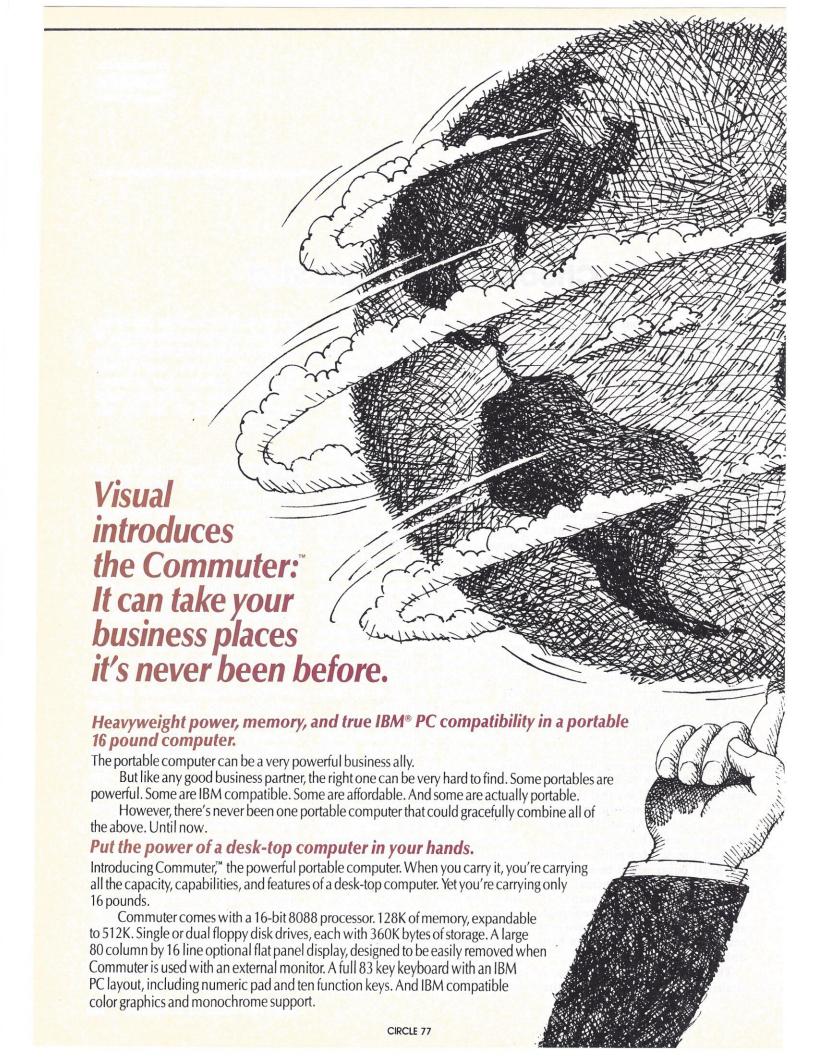
The software you buy usually comprises more than half the cost of the average system after a year or two of use—especially when you consider how much effort you'll put into learning how to use particular packages. If you ask the right questions before you make your choice, you'll find shopping for software and hardware a simple matter of selecting those pieces best suited for the job you need done.

**Q: Where can I go for an introductory course about computers?**

**A:** There are a lot of sources of basic computer information, depending on what your goals are, says Mark Clausen, computer marketing representative at Radio Shack in Vallejo, California. To get an overall view of what the computer marketplace is like, what kinds of products are being offered, and what people do with computers, the best source is probably computer magazines. Browse through a few of them at a newsstand, or ask some of your computer-using friends to recommend a couple of titles. You won't understand a lot of the language or concepts in most magazines at first, but you'll find that if you continue reading them, your knowledge will increase from one issue to the next.

Another source of this kind of broad exposure is computer shows and swap meets, where you can see many different kinds of computers, software, and equipment in one place. You'll also have the chance to question people who know what each product does, and just what it can do.

If you're after a sit-down, hands-on session with a computer in a learning environment, you should check out your local community college or

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CIRCLE 77

adult education program. More and more of these institutions are offering basic computer-literacy courses that cover computer operation and applications. If you're a novice, this type of course will be much more helpful in the beginning than jumping right into a course in BASIC programming. A lot of people make the mistake of taking a programming course before they know anything else about computers, and then get turned off about them because it seems so complex. Programming courses are for people who are interested in programming, but you don't have to know about programming to use a computer.

**Q:** I'm interested in a couple of popular software programs and would like to see them demonstrated. Unfortunately, all the salespeople I talk to are unwilling to demonstrate them, even though they have them in stock. How can I see the programs in action so I don't have to "buy blind?"

**A:** If all the salespeople you've talked with are either unable or unwilling to demonstate software, perhaps you need to go to a full service and support dealer. With the thousands of packages on the market, however, it is impossible to expect any dealer to be able to demonstrate all of them at a moment's notice.

John Weingarten of Mission Computer Centers of Northern California suggests you make an appointment a few days in advance so the salesperson has time to study the product and feel comfortable demonstrating it. He also suggests making it clear to a salesperson that you intend to reward his efforts by buying from him when you do make up your mind. This is a good way to develop a solid relationship with a salesperson, so that you can count on that person to take the time to research the products that interest you.

If you give a salesperson reason to believe you are a serious shopper and give him time to study the product, and he's still unwilling or unable to demonstrate the product, the answer is simple. Find another salesperson.

**Q:** I want to put a personal computer in my office for myself and my secretary to do word processing; what advice would you give?

**A:** Howard Manthei of Farnsworth Computer Center in Aurora, Ohio, says if you and your secretary have no prior experience with computers, "my first thought is Word Juggler (word-processing software) from Quark. It comes with replacement keycaps for the Apple IIe and III that have the program commands printed on their fronts, so there's nothing to memorize." And Manthei finds the program's documentation exceptionally easy to use. Moreover, Word Juggler allows for other program files to be used, like PFS:File data, for form-letter applications. And for offices with Apple IIs and IIIs, Word Juggler files are stored in the new ProDOS operating system that's Apple II- and III-compatible.

Manthei has seen some other impressive first-timer's programs as well. He likes PFS:Write from Software Publishing, praising its "exceptionally well-done, non-threatening documentation. And you have access to the PFS data base and graphics file, too."

He'd also put Apple Writer, from Apple, right up there in the top three. For Manthei, its major feature is the ability to use its WPL (Word Processing Language) feature. "From what I know it's the only word processor that lets you automate it." In other words, you can create "macros" where a single keystroke can enter a whole sequence of commands. For instance, Manthei knows an attorney who came in last summer and wanted to automate his office. He didn't want to spend the money for a dedicated word processor and had no background in computers at all. He took Apple Writer with the WPL feature, and now he's developed a whole word-processing application for law practices. The user is simply prompted on the screen to enter such things as the client's name, date of the accident, and so on. The word processor with WPL allows the user to just answer questions. It takes the input, calls out the appropriate paragraphs, replaces the information with what the typist entered, and produces the end draft.

Because of WPL, the user only responds to menu choices generated from the word-processing language; users don't have to learn word-processing commands to get the job done. Incidentally, the attorney, John Caluwaert, has now packaged his application as Legal Ease and is selling it as an application template for Apple Writer, costing a few hundred dollars. Manthei can put interested readers in touch with Caluwaert.

**Q:** I'm faced with my first major repair for my computer. The circuit board that controls my disk drive is not working. Is there any way someone without electronic equipment can repair the board at home?

**A:** You can give it a try. The first consideration, according to Dave Miller of Tech Computer Stores in Cambridge, Mass., is whether or not your computer is still under warranty. If you've purchased your computer within the past 90 days, then don't even open the cover of the computer. Pack it up—disk drive and all—and bring it to an authorized service representative. The repair will be covered under warranty.

If your warranty has expired, you can attempt to repair the circuit board yourself. You don't need any electronic equipment other than your own personal computer. The disk drive controller board contains a

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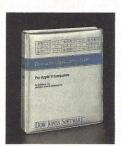
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handful of computer chips, most of which are available either from your local electronics supply house or through mail order. Copy the number from the top of each chip on the board and puchase them as replacement parts.

The chips you can purchase at your local store should cost about $1 each. So, even if you wind up sending the circuit out to be repaired it would have cost you only $5 or so more than if you didn't try to repair it yourself.

Once you have the chips, you replace each one and try the disk drive. Repeat this step until you've replaced all the chips that are available or until the drive is up and running. Chances are you'll find the bad chip and be able to replace it. If you still can't get your drive working, it's time to take it to the repair shop. In most cases you'll be able to exchange your controller board—plus $50—for one that has previously been repaired.

**Q:** I've had an occasional problem installing cards in my Apple II Plus motherboard. Sometimes a card will fit in with the components facing either right or left, and finding out which way was correct was a matter of trial and error. Is there a standard way to fit cards into slots?

**A:** First and foremost, read the instructions carefully before installing cards into your computer, says Neal Feldman, service technician at Quest Computers in Oakland, Calif. The manufacturer will almost always explain the correct way the peripheral should be installed and give a picture or diagram of a properly installed board.

A good rule of thumb is to look at the other boards in the computer, and put in any new one with the components facing the same way as the others. This almost always works, but occasionally you'll come across a board designed to fit with its components facing the opposite direction. Again, you can remove all doubt

by simply reading the instructions.

**Q:** What is the best way to back up data stored on a hard disk?

**A:** Jim Fricke of ComputerLand in Overland Park, Ill., says that tape—specifically, cartridge tape—is a strong candidate due to its low cost and high capacity.

Fricke talks about what he calls "the Winchester problem." We're seeing a lot of computers with 10Mbyte internal disks, he points out. And, he feels, backing up 10 Mbytes on floppy disks is just not acceptable. Tape cartridge can allow rapid file-by-file backup. Fricke likes the Tallgrass Technologies design particularly. It uses a format called PC/T-11 (Personal Computer Tape) that allows a user to archive or back up as much as 60Mbytes at once, which could later be conveniently downloaded to your hard disk in a file-by-file mode.

It's Fricke's belief that removable Winchester cartridges are going to miss the mark due to their high cost, low capacity, and the difficulties with interchanging them between different hard disk drive units. This difficulty hampers shipping them around the country. And, he says, a 5Mbyte cartridge costs $90 versus about $40 for a 60Mbyte tape cartridge like the 3M DC-600A used on various systems, and available at local office supply houses.

The next candidate is a videotape cartridge. Fricke feels it's unreasonable to ask owners to go out and buy a VCR and use a non-certified media. He thinks there's too great a risk of data dropping out. Manufacturers use a multiple redundant-copy technique to get around that, but Fricke feels uncomfortable with that kind of solution. Then there's streaming tape drives. While these offer efficient straight backup, you can't access particular files—you have to stream the whole tape back into your hard disk to get at any data. Fricke doesn't

think that allows most businesses the flexibility they need.

For using hard disks of 10Mbytes and over, Fricke recommends Tallgrass drives with integrated tape backup. Using this system under IBM PC DOS 2.0, you can specify the date, and all those files past that date will be saved to tape, using a file-by-file mode. Then you just type in a command to copy the files back into the computer.

Tallgrass also makes a cartridge tape back-up unit for use with the IBM or Texas Instruments hard disk systems. Fricke quotes the backup-only unit at about $2000, and the 12.5Mbyte (formatted) hard disk drive with integral tape cartridge backup at around $3500.

**Q:** I'm thinking of buying a hard disk that would interface with the parallel port of my computer. Does this preclude using my Epson parallel printer?

**A:** No. There are products available that convert serial to parallel signals so you can attach printers using Centronics protocols to an RS-232 port. According to Brad Baldwin, a technical consultant in Fremont, Calif., Epson also makes a serial card that fastens internally to the printer.

"I prefer the Microfazer from Quadram Corporation because it adds memory for print buffering and also converts serial to parallel," Baldwin says.

**Q:** I've decided to computerize my business, and I want to do it as quickly as possible. How long will it take to make the switch?

**A:** That depends on the size of your business, how many software packages you will be using, and how familiar you are with computers. Novices should make the transition slowly, advises Tiffany Waggoner,

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customer hot-line technician at ComputerLand of Western Washington. "The smartest thing you can do is to allow yourself a few weeks of 'playtime,'" she explains. "Play around with the computer and the software packages until you feel comfortable using them."

**Q:** I see a lot of educational programs for children these days, but most of them are only available for the lower-priced computers. Is there an easy way to convert them for use on my CP/M-based system?

**A:** If the programs are written in a language that runs on your computer, like BASIC, then conversion is possible if you know a lot about programming your computer. Even so, though, this will take a lot of time and effort, says Mark Clausen, computer marketing representative at Radio Shack in Vallejo, California.

It's a lot cheaper in the long run to invest in an inexpensive home computer for your kids, and let them use it for educational or game programs. Converting just one program might take several hours, if it's possible at all, while you can avoid the problem completely by investing $500 or so in a home computer. This solution also avoids any conflicts over who gets to use the computer.

**Q:** What should I know about portable computers before buying one?

**A:** Portable computers fit into two basic categories: lap-size and transportable. A lap-size computer is generally small enough to fit into a briefcase (or fit comfortably on your lap). It typically includes a minimal amount of memory, a tiny LCD screen, and is extremely lightweight. With the aid of a modem, a lap-size model can be invaluable to the person who works in the field or

travels extensively. There are a number of expandable models available for under $1000, which include a standard printer port.

Transportable computers are usually self-contained systems, meaning the monitor, disk drives, and controller are all contained in one compact package. This makes them considerably heavier than a lap-size unit. They are called transportable because they can be conveniently closed up and moved from one location to another.

These computers offer significantly more memory as a standard feature than do their lap-sized counterparts (64k and up). They also include one or more disk drives for data storage. Transportable computers generally offer all the features of a desk-top computer, with the advantage of being able to take the system with you without having to lug a number of components around. A few of the newer transportables weigh in at considerably less than their forerunners, and this is likely to be a trend in the future.

**Q:** Is there a difference between word processing and data processing?

**A:** As far as the computer is concerned, no. Computers process information, whether that information is a word, number, or symbol. Computer programs tell computers to process different kinds of information in different ways, and that's where the distinction lies.

Word processing involves the storage and manipulation of words—just like the words you would write on paper. The computer is programmed to locate, or format words in specific places on paper, and to allow you to enter and move the words around much like you would with a typewriter and scissors and paste.

Data processing is mostly thought of as the storage and manipulation of general information—client records,

mailing lists, personnel files, parts lists, or whatever. It allows you to store the data in various forms, like paper forms, but then you can sort it or search through it selectively, or perform calculations on it.

**Q:** Recently I read about the Model 100 personal computer from Radio Shack. The article said you can type documents into the computer's memory and the computer will retain the information even after you turn the computer off. I find this hard to believe since with my Apple I lose everything in memory when I turn off the power. That's why you're told to save the information on disk or tape. Did I misread this?

**A:** Believe it or not, the Model 100 does retain the documents you type into memory. The computer uses two sets of batteries: One set powers the computer itself, and the second set powers the memory when the main power to the computer is turned off.

According to Sherry Oaks of the Radio Shack Computer Center in Columbus, Ga., the second set of batteries enables the computer to keep information in memory for between 14 to 30 days, depending upon the amount of information you have stored in memory. The more data contained in memory, the shorter time it will be retained. The second set of batteries can be recharged when you have the Model 100 plugged into the wall socket. As long as you charge the Model 100 every 15 to 30 days, you'll always have the data retained in memory—unless you erase it.

Generally, the same principle holds true for both the Model 100, your Apple, or any other personal computer. When the power is turned off, you lose everything you have in RAM. But since the Model 100's power is never turned off to the RAM, you always keep a trickle of current flowing at all times.

This second set of batteries also acts as a backup power supply in case the main power, first set of batteries, or the AC power supplies should fail.

**Q: I live in an area where the power fails periodically. How can I protect my computer system against damage from such a failure?**

**A:** Dave McKnelly, manager of the ComputerLand store in Dover, Del., offers two basic ways: (1) protect your data with frequent, systematic backups of data, as well as having backups of applications software; (2) get a UPS (uninterruptible power supply).

A U.P.S. consists of a rechargeable battery and electronic sensing and switching circuitry. You plug the computer into the power supply, and the power supply into your line outlet. This protection device will sense a power failure, and automatically switch its current output from line to battery fast enough to keep your computer system running for anywhere from six to 20 minutes, depending on the model of UPS and the current draw of your system. This gives you enough time to save your data and power down. If you also had a gas-powered generator like the ones Honda makes, you could connect that to the UPS and keep going indefinitely.

Frequent backup is a lot of work, while a UPS is a lot of money—usually $400 to $900. And under some circumstances, both forms of protection are needed. A UPS won't protect against media failure, for instance, or an incorrect command wiping out all the data on a disk. But, McKnelly says, there are circumstances that warrant the time and money. People who run business accounting packages on hard disk systems, for example, would probably need such protection. If the power goes down while adding information to the system, everything input since the last backup will die, requiring all

work to be repeated. Worse yet, McKnelly says most hard disks on the market will experience a head crash during a write or read operation if the power goes off. This could scramble the disk directory and cause you to lose everything on the disk. Some hard disks have a dedicated landing spot; they will gather all the residual current left in the capacitors and circuits of a system at the moment of power failure and park the head out of harm's way in a dedicated "landing spot." The Fortune Systems computer's hard disk is an example of this type of design. Even here, though, you'll still lose all the data that hasn't been transmitted at the time of failure.

McKnelly recommends the EPD Grizzly UPS. It costs $895, making it a top-of-the-line UPS. The Grizzly detects the pulsation signaling an impending power loss and kicks in, giving you about 20 minutes to close out your files and shut down your system. If that happens two or three times a year, McKnelly estimates the data you save and the damage you avoid will pay for the cost of the Grizzly.

**Q: I've installed cards in all but two of the available slots on my Apple IIe's motherboard. Do you think I need a cooling fan for my system?**

**A:** Yes, says Neal Feldman, service technician at Quest Computers in Oakland, Calif. The Apple IIe has vents on both sides to allow airflow through the system, but when you have more than two cards attached to the motherboard, airflow can be restricted and the computer might overheat. Most chips have a maximum heat tolerance of about 130 degrees—if the computer gets hotter than that, you risk chip failure.

A good fan for the Apple IIe, says Feldman, is the System Saver from Kensington Microware (New York, N.Y.). The fan fits directly over the

Apple's air vent. The System Saver will also protect your computer from line surge.

**Q: How can I automate form processing in my business—including filing and, if possible, some bookkeeping functions?**

**A:** According to Howard Manthei of Farnsworth Computer Center in Aurora, Ohio, a number of data-base management programs can be adapted to serve this group of functions, but one was tailor-made for this sort of operation: VersaForm, from Applied Software Technology of Los Gatos, California. This filing-system and data-base program allows you to format or design a report using the forms that you presently type on. It allows a business to automate its present forms without having to entirely design new reports and formats dictated by a program. And it will serve as both a filing and—to some extent—a bookkeeping package.

Manthei also likes VersaForm because auxiliary software "templates" are available for things like bookkeeping applications—there's even one for legal office management. This provides ready-made forms on-screen—all you do is fill them in. It prints out the data right on your present forms.

Manthei has several customers—physicians—using VersaForm for insurance forms and invoices. Companies that don't need a full-blown accounting system can use the latter function quite well. He's sold the package to Fliptrack Learning Systems, a publisher, who and it uses it to track each sale by region, author, and a number of other parameters. The end product is an invoice with a copy on disk for analysis by product, region, and author. This allows Fliptrack to do sales analyses most accounting packages don't provide.

Manthei praises the documentation for being both easy to learn

**Era one.**

Era One saw the personal computer increase the productivity of the business executive dramatically. Yet for all their power, personal computers have not fulfilled their potential. Because the different makes have been unable to communicate reliably with one another and with the various public data networks.

## Era two.

But now, Microcom moves the personal computer into a new era of communications compatibility with Era 2–the first Personal Computer Communications System with the industry-standard communications protocol MNP. Era 2 finally enables dissimilar personal computers to communicate with one another reliably and cost effectively. It also allows the personal computer to access public data networks easily and error-free.

**A closer look at Era 2.**

Era 2 with MNP is a 1200 baud Communications System (software and inboard modem) designed to operate with the IBM PC, PC XT, compatibles and PCjr; Apple IIe, Apple II Plus and Apple II. Its features include IBM 3101, Digital VT-100 and VT-52 terminal emulations. Era 2 executes multiple functions with a single keystroke. Stores a virtually unlimited number of telephone numbers – each one up to 31 digits. Era 2 is Bell 212A compatible, works with Pulse or Touch-tone™ dialing. Its speaker alerts you to busy signals, wrong numbers, etc. Era 2 gives your personal computer error-free compatibility with other personal computers, data bases, mainframes, almost any information source that can be reached by telephone line.

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Era 2's electronics are so well put together we're able to offer a four-year warranty– twice the term of protection you get from yesterday's products.
On top of that our product support is outstanding. Our 800 number operates 9AM to 8PM (EST), Mondays through Fridays, 9AM to 5PM Saturdays with experts available to solve any problem or answer any question.
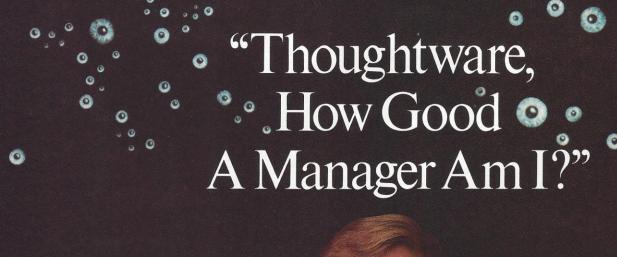
**The state of the price of the state of the art.**

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Move your personal computer forward into a new era of communications. Visit your Era 2 dealer soon. Call 800-322-ERA2 (in MA, 617-762-9310) for the name of one nearest you. Or write us, Microcom, Inc., 1400A Providence Highway, Norwood, MA 02062. We'll send you a brochure with complete information on Era 2. **Only from Microcom: The Personal Computer Communications System with MNP.**

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How good a manager are you? Thoughtware Module 1.1 "Assessing Personal Management Skills" will tell you. This program is a three-part, comprehensive self-assessment of your personal attitudes, behavior and understanding as they relate to your effectiveness as a manager.

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To introduce you to Thoughtware, we'll send you "Assessing Personal Management Skills" (which normally sells for $350), for only $150. (See adjacent column for details.) *Offer expires April 30, 1984.*

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*(continued from page 160)* and comprehensive. He says, "I've had very good luck with first-time computer users mastering it." The comprehensive Help screens do help, he says. And VersaForm comes in a hard-disk version.

Manthei adds that for skilled Pascal programmers, VersaForm can be modified extensively, especially in its reporting aspects. For example, VersaForm does not allow batch data entry. You need to call each record to the screen and make the desired change. However, a programmer could write a routine to accept inputs in a batch mode, and then have the data ship out to the appropriate records, or even do a mass update— change all records with a particular ZIP code, for instance.

**Q:** I hear so much about the possibilities of bubble memory. How soon will it be available for personal computers, how much will it cost on the average, and how much information can it store?

**A:** There are forms of bubble memory already available— Teleram's T-3000 portable computer has built-in bubble memory, and Sharp Electronics sells bubble cartridges for use with its portables.

The advantage of bubble memory is in the convenience and reliability of such a memory device, which makes it especially suited to portable models. There are moving parts in disk drives, and reading heads can be damaged when moving the unit around. Bubble memory is essentially a piece of metal, and it works like a ROM chip in that the data stays in it indefinitely without any power source. In actuality, it is not Read Only Memory, but RAM because you can write over the data stored in it.

The big disadvantage to bubble memory is price. Though the technology has been around, most computer manufacturers do not think the market is very large for bubble memories for personal computers. There are some, though, that see a real potential, especially for the portable market.
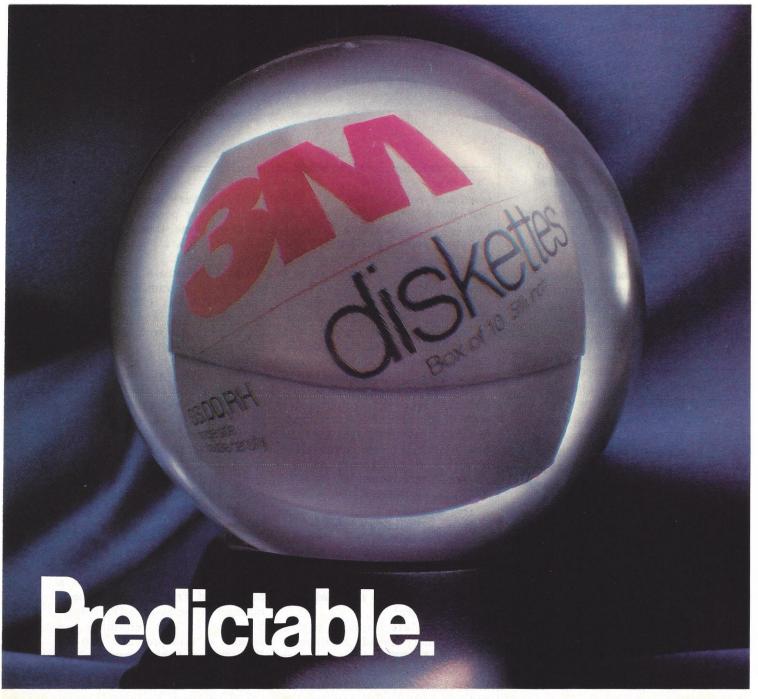
Tom Mucciolo, marketing manager of Teleram, says the Teleram T-3000 has 128k of bubble memory built in, and you can upgrade the system with another 128k for $500.

To give you an idea of what bubble memory is like, Mucciolo says, "It works just like a diskette, except there are no moving parts needed to read or write on it, which is a real advantage in a portable. With a disk drive built in, there are moving parts which can be damaged." Mucciolo says the bubble memory works faster than a floppy disk drive, but is usually slower than battery-backed CMOS RAM.

Sharp Electronics markets the PC-5000 portable, which has 128k of RAM, and 192k of ROM built in. The PC-5000 is equipped with a bubble read. Frank Barbosa, general manager of the Systems Division for Sharp, says "For reliability, we decided to load programs into the PC-5000 via bubble memory." So Sharp developed the bubble cartridge, which is about half the size of a cigarette pack and holds 128k of memory.

"You use the bubble cartridge as people would use a floppy," says Barbosa. "We have programs on cartridges—SuperCalc and Super-Writer—and blank cartridges can be used as working space." The bubble cartridge programs retail for $369 each, and a blank bubble cartridge sells for $269. Barbosa points out that a computer dealer could also download from a floppy program to a blank bubble cartridge if the program is compatible with the PC-5000 8-line display.

Barbosa hails the advantages of a bubble cartridge: "It's so easy to use and so light to carry and so durable. You don't have to worry about

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3M diskettes are made at 3M. That way, we have complete control over the entire manufacturing process. And you can have complete confidence in the reliability of every 3M diskette you buy.

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# 3M

CIRCLE 8

dust or damaged read heads."

Barbosa admits that the biggest drawback to bubble memory is the cost, a problem that may diminish as more manufacturers produce bubble memory. Mucciolo thinks some changes are coming. "If you don't see the cost coming down," says Mucciolo, "you'll see the storage going up." So, for the same price, you may soon be able to get 256k instead of 128k.

**Q:** I have trouble loading certain programs in my Rana disk drive. Is that a problem with the drive or with the program itself?

**A:** We took your question to the Rana technical support department. They suggested that the most likely cause of the problem is drive speed, since some copy-protection methods are highly dependent upon drive speed. You can find a routine to check the speed of your drive in many utility packages, such as The Filer from Central Point Software.

Adjusting drive speed to within the correct range is a very simple operation, and shouldn't take more than a few minutes. Rana also stated that should you need to adjust your drive speed, it's better to have your drives running a bit slow than a bit fast.

**Q:** Which printers are the quietest? I want to purchase a printer that won't blast me out of the office.

**A:** Noise is an important consideration when buying a printer for home or office. If you can't make a phone call while printing—let alone think over all the racket—your productivity and nerves really suffer. This is even a bigger problem when a number of printers are used in one office environment.

Brad Baldwin, printer consultant, offers several suggestions to people sensitive to printer noise. "Letter-

quality printers, often the noisiest culprits, can be toned down considerably with a noise hood or cover," he says. These silencing devices generally cost between $400 and $500, but are worth the money if you work in a noise-sensitive environment and require a letter-quality printer.

If you can get by without letter quality, Baldwin points out that dot-matrix printers are often much quieter. Some of the newer dot-matrix printers offer correspondence-quality printing at much lower decibels, as well as being easier on your wallet.

Ink-jet printers are the newest dot-matrix printers to hit the market. These models use non-impact printing, meaning the print head doesn't make contact with the paper. Instead, ink-jet printers carefully spray the ink on the page through continuous channeled streams—a process that is much kinder to the human ear. If noise is a big consideration to you, you may want to look into the new ink-jet printers, some of which offer color graphics capabilities.

**Q:** What are some basic guidelines for selecting a printer?

**A:** We asked printer consultant Brad Baldwin of Fremont, Calif., to share his suggestions with us, and Baldwin provided us with a checklist of items to consider.

"First, you should assess whether you'll need letter-quality print or whether dot-matrix print quality will do," he says. Once you've determined which type of printer best suits your business and personal needs, find a dealer who stocks a variety of printers and backs up his products with a competent service department, Baldwin suggests.

Baldwin cites noise, speed, and documentation as the other key factors to explore when making a purchasing decision. "Thumb through the manual and make sure it's readable and thoroughly covers the prod-

uct," he says. If noise level is important to you, have the salesperson demonstrate the printer so you can get an idea how noisy it is. This also allows you to check the speed and view the print quality. "Make sure the printer has the capability to do boldface printing, underline and super- and subscripts if you need these features," Baldwin notes. Also, if you need graphics or color capabilities, make the salesperson aware of it, he suggests.

**Q:** Are there any guidelines for proper protocol or etiquette when using electronic bulletin boards? If so, what are they?

**A:** Judith Windt, of Stanford University's Information Technology Services, has compiled a helpful set of guidelines for computer etiquette when picking up and leaving electronic messages. If you adhere to the following suggestions, you should run little risk of offending the opposite party or appearing amateurish or discourteous.

**1.** If your message is long and complicated, or if you want the recipient to comment on or review the contents, note in the message that a paper copy is to follow. "Most people still find it difficult to read from the screen," she says.

**2.** Follow up or precede complicated computer messages with a face-to-face meeting or phone call in order to clarify obscure points.

**3.** Try to read and respond to all messages as soon as possible.

**4.** Be careful of your tone. "People react to electronic messages in different ways. In the absence of body language cues, some people wonder whether to be formal or informal. Until you become chummier with the other person, it's usually safer to err on the side of formality," says Windt.

**5.** Never try to get past another person's office visitors or telephone busy signals via an electronic message.

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FILE and REPORT were designed for people without computer experience. So all instructions are easy to understand. And you can be productive quickly.

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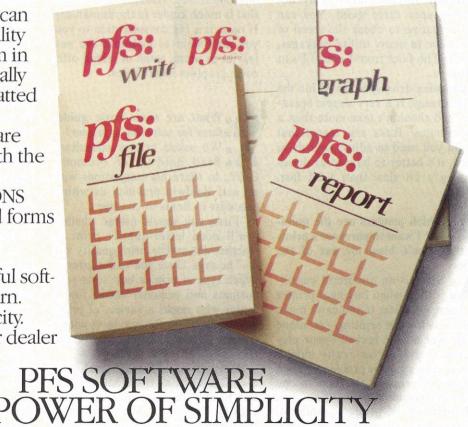
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**6.** Don't send messages to the president of the company unless he asks you to.

**7.** Resist the temptation to read what's on the screen of a person you are visiting. You wouldn't think of reading a person's paper mail, so why be an electronic snoop?

**8.** Send yourself a copy of the message you send someone else, especially if it requires a reply. "This ploy will save you embarrassment when you get the reply a week later and can't figure out what your question was," she says.

**Q:** I have an IBM Personal Computer, and would like to know if there is any service I can hook into to get stock market quotes. Also, what is the cost?

**A:** There are a number of services out there. Here are two that offer different possibilities:

Compubyte, Inc., of Naples, Fla., developer of investment software, has a nationwide service called ByteLine which lets IBM Personal Computer users access a data base of news and investment information supplied to Compubyte by the Associated Press. To have access to this service, you have to buy a software program for $295.

National and regional news and weather, as well as the day's closing stock market statistics, are supplied starting at 6:00 each night. The information is current as of 4 p.m.

ByteLine will also help you follow your particular stocks. With the ByteLine software, you enter the securities you want to follow including stocks, bonds, mutual funds, and options. Every day ByteLine will then provide the closing prices on your securities, and compute the market value, yield, and unrealized gain or loss on each security as well as for your total portfolio. For more details on ByteLine, contact Compubyte at (800) 221-4636.

Another service called Desk Top

Broker from C.D. Anderson & Co. lets investors enter transactions, maintain portfolios, and see current stock prices through their personal computers. The system is on-line 24 hours a day, seven days a week.

The system runs on Apple and IBM personal computers, as well as systems compatible with either Apple or IBM. Desk Top Broker connects via modem to Anderson's wire room. Customers pay a one-time fee of $195, which includes software and registration fees. This service does charge for on-line time; fees range from 40 cents a minute during business hours, to 10 cents a minute nights and weekends. Keep in mind, though, that Desk Top Broker lets you make transactions through your personal computer which ByteLine doesn't do. And, if you do make a transaction, you must also pay a transaction charge to Anderson. Anderson says these charges are far less than what you would pay to a full-commission broker. You can contact C.D. Anderson & Co in San Francisco, Calif., at (415) 433-2120.

**Q:** An article in the October issue of *Personal Computing* told how a computer can protect your house, but I wonder: Does it hurt a computer to be left on for, say, weeks at a time while you're on vacation?

**A:** Two manufacturers of home security devices say leaving the computer on for long periods of time can't hurt it—if the system doesn't build up too much heat.

Nick Lecheler, products engineer at Savergy, Inc., in Fort Collins, Colo., says that in testing one of their products, the Computer Interface Module 112, they found no ill effects for the computer from leaving it on for a long time.

Lecheler points out that turning a computer on and off frequently may hurt the system more since you could wear out the mechanical parts. As far as the electronics go, Lecheler says,

"Most of the problem with leaving it on for weeks at a time is in the transformer. If the heat is dissipated properly in your system, you shouldn't have any problem with it being on that long."

Lloyd Bigley, president of Tomorrow Tech, in Gibsonia, Pa., adds his nay: "We've set up one of our programs on an Atari and had it run a couple of weeks 24 hours a day to test the program for bugs, and we had no problems with the computer."

**Q:** Should I buy a surge protector for my computer system and if so, how much should I spend?

**A:** According to Dave McKnelly, who manages the Dover, Del., ComputerLand store, surge protectors are another form of insurance for your computer. These devices protect the computer from line surges that can damage your data or your system itself.
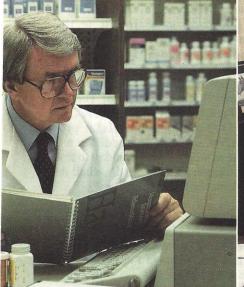
One easy way to tell if you're getting surges in your area, McKnelly says, is to watch an incandescent lamp. If you notice it dimming on occasion—each time your clothes dryer is turned on, for example—then you're getting voltage fluctuations. Another way is to have the power company come out and monitor your line, or have your computer store come out and do the same.

McKnelly says the surge protector companies, like EPD (Electronic Protection Devices, Inc.) of Waltham, Mass., have estimated that up to 75 percent of computer failures can be attributed to current surges in the line.
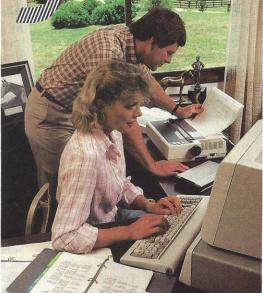
Surge protectors range in price from $32 to $140, and consist of a box with anywhere from one to six grounded three-prong outlets, and a power on/off switch and lights.

The top-of-the-line surge protectors have certain features the others lack, such as a line and a ground light for diagnosing problems. The simpler protectors lack such

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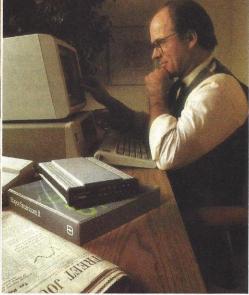


**What will counteract NDC 74-0054-60?**



**Gary: The pedigrees for next week's auction are as follows...**



**Sold 1000 shares at 33 for net profit of 6000. Richard.**

Wouldn't it be great if you could use your IBM®PC to tap into vast resource libraries across the country? To transfer files to your partner, upstate? Or from your broker, down the street?

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But any modem will send and receive data. Smartmodems also dial, answer and disconnect calls. Automatically. And without going through the telephone receiver, making them far superior to acoustic coupler modems.

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Both work with rotary dials, Touch-Tone® and key-set systems; connect to most time-sharing systems; and feature an audio speaker.

Smartmodem 1200B™ is also available as a plug-in board. Developed specifically for the PC, it comes packaged with Hayes' own communications software, Smartcom II.™

**Smartcom II. We spent a lot of time developing it, so you can spend less time using it.** Smartcom II prompts you in the simple steps required to create, send, receive, display, list, name and re-name files. It even receives data completely unattended—especially helpful when you're sending work from home to the office, or vice versa.

If you need it, there's always "help." This feature explains prompts, messages, etc. to make communicating extra easy.

With Smartcom II, it is. Case in point: Before you communicate with another system, you need to "set up" your computer to match the way the remote system transmits data. With Smartcom II, you do this only once. After that, parameters for 25 different remote systems are stored in a directory on Smartcom II.

Calling or answering a system listed in the directory requires just a few quick keystrokes.

You can store lengthy log-on sequences the same way. Press one key, and Smartcom II automatically connects you to a utility or information service.

## Hayes®

Smartcom II communications software.

NOTE: Smartmodem 1200B may also be installed in the IBM Personal Computer XT or the Expansion Unit.
In those units, another board installed in the slot to the immediate right of the Smartmodem 1200B may not clear the modem; also, the brackets may not fit properly. If this occurs, the slot to the right of the modem should be left empty.

And, in addition to the IBM PC, Smartcom II is also available for the DEC Rainbow™ 100, Xerox 820-II,™ and Kaypro II™ personal computers.

**Backed by the experience and reputation of Hayes.** A solid leader in the microcomputer industry, Hayes provides excellent documentation for all products. A limited two-year warranty on all hardware. And full support from us to your dealer.

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high-tech features, but still provide the basic protection needed.

As far as what you should spend, McKnelly feels the low-end products are best suited for people who aren't dealing with important data, and who live in low-risk surge areas. But if you're investing $10,000 or more on a hard disk system for business use, you might want to pay for the extra features of the top-of-the-line surge protector.

If you don't know whether or not the area in which you are using your computer is a low-risk area, such an area is generally sparsely populated with a mild climate, and hence has little demand on electricity for air conditioner compressors, etc. A higher risk would be for those people who live in an apartment complex; they would be better off with added protection, to guard against periodic overloads. Some areas will have electronic "noise" as well as current surges, and the noise can cause data/computation errors as well. High-end protectors protect against both kinds of problems.

Says McKnelly, "I'd recommend a surge protector to anybody." The features you should have, and how much you should spend, depends on the type of protection you need.

**Q:** How important is RAM expandability in choosing a computer?

**A:** For home or individual uses, 64k of RAM is adequate, but if you're using the computer in business, you'll probably want the ability to expand the RAM to at least 256k, says Brad Roth of Infomax Computers in Walnut Creek, Calif. Higher RAM capacities are necessary for sophisticated accounting or inventory programs, or even for the most powerful communications and spreadsheet programs.

Of course, RAM expandability will probably determine the kind of computer you buy, because 8-bit computers are only capable of addressing 64k of RAM at once, while 16-bit computers can address about 1Mbyte of RAM directly.

**Q:** I'm looking for a system or device that will help develop the communicative and educational skills of my 6-year-old son, who has cerebral palsy. He has good physical control of the index finger on his left hand and some use of the index finger on his right hand, with less accurate control.

Since my son is learning to read and write, I thought I might try a word-processing approach with standard keyboard, display, and printer. The problem is the use of the keyboard and the two-key commands for many functions. Do you know of some low-end system that has function keys, or perhaps some device that will make it easier for my son to interact with the computer?

**A:** There are many alternate input devices on the market today which have been designed to make interaction with the personal computer significantly easier than the keyboard. One such device, a touchpad, may be just what you are looking for.

The touchpad functions as a substitute for the keyboard, allowing computer interaction by simple one- or two-finger touch. There are currently at least two on the market: KoalaPad from Koala Technologies, and PowerPad from Chalk Board. Both are priced for the home user. (Touch technology is not new, but most touchpad devices are priced out of the reach of the home user.)

KoalaPad uses a 4″ by 4″ active area that translates touch at a particular spot into a letter or command for the software you use it with. Priced at $125, KoalaPad is compatible with most of Koala Technologies's game and educational software, and connects to Atari, Apple, Commodore, and IBM systems.

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Koala Technologies Corporation is located in Los Altos, Calif., and you can reach them at (800) 227-6703.

PowerPad uses a 12″ by 12″ active area. Rodney Price, vice-president of engineering at Chalk Board, explains: "The 12″ by 12″ surface can be broken up into $1\frac{1}{2}$″ square 'buttons' which gives the child a big target." Price says as long as the finger falls into that appropriate area, PowerPad will translate it. You can also design "dead" areas around the "buttons" so the computer won't misinterpret the entry.

PowerPad also has software designed for it. Called Leonardo's Library, this series of software includes packages in music, math, visual arts, language arts, and social studies. Chalk Board plans to expand the number of applications to 30. Keyboard overlays are used with the software. For music, the child sees a piano keyboard simulation; for art, a canvas; for games, a game board, etc.

PowerPad runs on the same systems as the KoalaPad, and connects to the computer via a serial interface. You can reach Chalk Board Inc. in Atlanta, Ga., at (404) 496-0101.

**Q:** I'd like to use a spreadsheet program periodically in my work. How do I pick an easy-to-use program with features an occasional user would need?

**A:** Howard Manthei of Farnsworth Computer Center in Aurora, Ohio, says "If you're going to be a casual user (not using it daily—maybe just once or twice a month), we'd tend to show you ones with Help screens available. And probably the single most popular feature would be using fully spelled-out commands rather than an abbreviated letter."

Manthei says the casual user should also look for well-written documentation, like that of Artsci's Magicalc, which Manthei considers to be an exceptional value. He says it uses the older VisiCalc's commands almost to the letter, yet it has some advanced features VisiCalc lacks. More importantly, it gives the Apple II user, in particular, extra memory—at least 64k beyond the standard 48k. And you can add multiples of 64k as well. It doesn't require buying a separate-memory/80-column preboot disk such as the ones Videx or Titan Systems provide for VisiCalc.

Manthei says that whatever light-duty spreadsheet you buy, you could use Magicalc as a benchmark program for simplicity of operation and utility. It lists for $150.

VisiCorp's VisiCalc and Microsoft's Multiplan fall midway between light- and heavy-duty programs in Manthei's opinion. They are priced accordingly from $250 to $300.

**Q:** Is floppy disk storage really so much better than cassette tape storage that it justifies the higher cost?

**A:** According to Dave McKnelly, manager of the Dover, Del., ComputerLand, it does—for all but those on the tightest budget. Fundamentally, a cassette recorder is a sequential access device, while most disk drives are random access devices. This means a cassette recorder will have to search the entire length of the tape to find the data you need, while a disk drive can read the information off a floppy disk much faster by seeking out the information you need using the read/write head.

So, not only is the process of locating information inherently more cumbersome with a tape device, it's also slower. A disk drive spins at 360 RPM—around 55 mph under the read/write head at the edge of the disk—while cassette tape moves at .1 mph. The slow speed and sequential access make for very slow operation.

Also, the amount of storage you can put on a disk is usually much greater than the amount of data you

could store on a cassette tape, though this varies from computer to computer.

**Q:** We have several personal computers in our manufacturing plant. After purchasing two electronic air cleaners to compensate for the dusty environment, we developed problems with our printouts; they come out garbled, with symbols or characters where words should be.

We tried using different software packages, with the same results. Is it possible that the electronic air cleaners are the cause of the problem?

**A:** Jim Garrity of Electronic Protection Devices, Inc., in Waltham, Mass., says line interference is the root of your problem, and yes, just about anything that uses electricity can cause interference. It can enter your system in two ways—through the line or through the air in the room.

If the problem occurs only when the air filters are plugged in and running, says Garrity, then you've isolated the filters as the probable cause. Probable, but not definite.

One way to test your theory is to plug the air cleaners into a different circuit than you normally have them plugged into, and see if the problem clears up. If that doesn't improve the situation, the interference could still be coming through the line via the power box, in which case a surge suppressor will help.

However, if after all that the problem persists, then you have interference coming through the air. A surge protector can't help here; you need a shield.

Garrity recommends that before you run out and spend a lot of money on a sophisticated shield, you try a homemade shield first: All it requires is that you purchase aluminum foil, which you would set up as a screen around each air cleaner. This should cut out any electronic noise that might be transmitted through the air.

**Q:** My new modem lets me hook up to The Source and look at data, but it won't let me save it. Is there anything I can do?

**A:** Actually, it's not your modem that is the limiting factor; it's the software that comes with it. A modem is no good if you don't have software with file transfer capabilities to save what you receive as well as send files to others.

There are programs of this kind available for most computers. For instance, according to Lewis Watmore, assistant technical support representative of Computer Center Stores of San Jose, Calif., there is a new software package called Superterm 64 which lets Commodore personal computer users save data using a VIC or a HES modem. Either of these modems, in conjunction with the software, will allow you to store data you've accessed through The Source.

**Q:** Is there any way to recalculate my spreadsheet data after I've moved it into a word-processing file?

**A:** Steve Graziani of Quest Computers in Millbrae, Calif., says that even with most so-called "integrated" software, once you move the spreadsheet into the word processor, the spreadsheet becomes just a portion of text. The spreadsheet equations needed for recalculation of cells don't move over to the word processor with the data. And even if they did, the program would not understand how to use the formulas, since the word processor was not designed to do so—the spreadsheet was. What this all means is that if you find you made a mistake in a table *after* the table has been put into text, you cannot correct it.

Some integrated software packages deal with this problem by storing the spreadsheet as a separate file. It prints this file through the chaining of print commands. The spreadsheet never actually moves into the word processor, and therefore can still be

calculated. However, it can't be edited, which would take advantage of the word processor's features.

But there are packages that allow you to work freely with both text and spreadsheets at the same time. For instance, T/Maker III from T/Maker of Mountain View, Calif., provides for the spreadsheet portion of the program to work within the text editor. Thus, you can change numbers or recalculate at any time. Equations are maintained along with your word-processing notations (margins, etc.) in the text editor, so you can work between spreadsheet and text without changing disks or files. If you are writing a letter which includes a table in between two paragraphs of text, you can create and change the table in the same file as your letter.

**Q:** Our company recently purchased two Commodore 64 systems, and we are now experiencing problems with our four 1541 disk drives. The problem occurs when programs and files are saved over themselves. Is this a problem with the 1541 disk drive itself?

**A:** According to Commodore, there is an error in the part of the 1541 disk-drive manual that tells you how to save a revised file under its original name. You cannot Save and Replace a file with the 1541—it doesn't work. You have to Scratch and Replace instead.

Here's how you do it: Call up the file you want to revise. With it safely positioned in the computer's memory, tell the drive to erase that file from the disk. After revising the file in memory, save it out again under the original name. What this means is you have to perform two separate functions to save a revised letter under its original name.

Commodore also advises you not to use disks you tried to Save and Replace files on, since they are no longer good.

**Q.** I'm looking for a portable computer that I can take on frequent trips between the United States and Europe. Is it difficult to convert these computers from 115 volt to 220 volt power?

**A.** Most portable computers have a switch that changes them from 115-volt, 60-cycle power to 220-volt, 50-cycle power, says Phil Goodman of Concept Computer Systems in Oakland, Calif. The switch is often located inside the computer case to prevent the setting from being changed by accident.

Remember, your computer is a piece of electrical equipment. Trying to run your computer on 115-volt current with the switch set to 220 will definitely cause problems, such as damaging the computer's power supply and circuitry.

If the switch is internal, you may have to have it reset by a qualified service technician to maintain your computer's warranty.

**Q.** Why must I copy some programs onto my own initialized disk before I can use them?

**A.** Bill Abney of Forum 80, a software firm that manufactures sophisticated electronic-mail programs, points to one major factor—money. Ready-to-run programs—those you don't have to reload onto an initialized disk—include the disk operating system on the disk. To supply this, according to Abney, the manufacturer must pay royalties to the owner of the disk operating system. This royalty cost would, of course, be passed on to the customer.

To keep the package price down, some software is sold without the disk operating system on the program disk. The customer, therefore, has to load the program onto an initialized disk containing the disk operating system. So, by taking a few moments to load the program onto another disk, you are actually saving yourself a few dollars.

**Q:** I've just purchased a computer for my business—a tax preparation and accounting concern. Losing data through a power failure would be a disaster for me; what can I do to avoid this?

**A:** Make backup copies of all your disks, says Tiffany Waggoner, a customer hot-line technician with ComputerLand of Western Washington. "I get calls all the time from people who have lost data in one way or another," she says. "Sometimes we can rescue the information, but sometimes it's lost for good. Always make backup disks of the data that's vital to your business to save you from losing it during any crashes or power loss."

**Q:** I'd like to buy a spreadsheet program for daily, intensive use—what do you recommend I should look for?

**A:** Howard Manthei of Farnsworth Computer Center in Aurora, Ohio, offers some guidelines. He feels a heavy-duty spreadsheet should have extended features like variable column widths and columnar sorting. Columnar sorting enables you to rearrange a list of names or numbers in ascending, descending, or alphabetical order. You'll want to be able to combine or merge individual spreadsheets into one composite sheet, so you can merge the budgets of several departments into one for the company as a whole, for instance.

Next, Manthei advises looking for graphics capability—either within the program, or in another, so you can generate bar and pie charts and the like. The last important feature, says Manthei, would be the kind of keystroke memory available with advanced VisiCalc. This lets you automate a lot of the commands by installing macros, where one keystroke can set off an entire sequence of operations. He says you should expect to pay $375 to $400 for one of these programs. However, he adds that Microsoft's Multiplan at $275 has a lot of these desirable features.

Manthei says there are enough spreadsheet programs out there so that you don't have to limit yourself to the two or three leading name brands. And he doesn't feel any one program has it all over the rest. He likes Multiplan's sorting feature and spelled-out commands, and Advanced VisiCalc's keystroke memory. Both programs have Help menus.

**Q:** How can I take advantage of all my printer's special features with WordStar?

**A:** You need two things to accomplish this: your printer instructions and your computer manual. The manual for your printer includes a section on command codes. These codes must be installed in WordStar to turn on the special features like boldface, underlining and condensed print.

WordStar's INSTALL program, contained on your program diskette, must be modified to include the individual command codes for your particular printer. The chart generally found at the back of your printer manual gives each code and a description of the printing feature it controls.

Review the instructions for INSTALL in your WordStar manual for specific directions on how to input the codes.

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**CORRECTION**

In our January 1984 feature on discovery-based software, the reference to the Interpreting Graphs package from Conduit (photo caption, page 57) is incorrect. The correct caption should read: "In Green Globs (part of the Graphing Equations package from Conduit), the color. . . ."

We regret our error.

### DATA BASES
*(continued from page 113)*

the connection started, when it stopped, and the date of the call. Then I want to select the calls for a week, and print out a report that will show the name of the person called, the connect time of the call, and the story I was working on when I made the call. Clearly, that requires a relational manager (at least as far as I can tell). Again, I could just build a call-report form that would contain the name of the callee and the story connection, but I don't want to do that—it would require entering that information more than once.

Marie Chevrier faced the same kind of a problem, although hers was quite a bit more complex than the car-fleet or phone-log problem. Chevrier is the administrative assistant to the King County medical examiner in Seattle, Washington. She has to keep a record of every case that comes through the office, and that's a lot of records. In addition, she has to produce reports that relate a lot of different things together.

"We do examinations on everyone who suffered a sudden, unexpected, or violent death," she says, "and we keep demographics on every one of them. We also keep a medical and toxicological file on these cases— whether the subject was taking medication, or whether there were toxic substances present in the body. We use r:Base 4000 (from Microrim in Bellevue, Wash.) to keep track of them on a IBM Personal Computer."

Before the computer came to the medical examiner's office, all the records were kept on paper. But the task of developing reports from the paper forms was too time consuming. Something had to be done. "I didn't have any computer experience," recalls Chevrier. "I just started looking around for something that I thought would do the job I needed done. Three years ago we started working with the Statistical Package for the Social Sciences on the mainframe

computer at the University of Washington, but it took forever to code the input, and we had a lot of errors on top of that.

"A guy from the county suggested Microrim (the predecessor to r:Base 4000) and I thought it suited our needs, so we transferred the data over. Like everything else with computers, I did it by just plunging in." Chevrier adds that the choice of Microrim was dictated, in part, because the company was close to her office, so if she ran into trouble she could get help quickly. After r:Base 4000 was released, she transferred over to that program.

Chevrier says she keeps one demographic file that includes everyone processed by the medical examiner's office. In that file she records the name of the deceased, the age, sex, date of death, and a case number. It is the case number that relates an item in every one of the files maintained on every case. Then in addition to the demographic file, there's the autopsy file where the results of the autopsy are kept, and a toxicology file that records any involvement with toxic substances, including alcohol and/or drugs. She also has a need to track the incident that led to the death, and to this end is preparing two files—one for suicides and one for traffic accidents. "I don't need to put that information into the main files," she says. "We have about 2000 cases every year, and of those only about 20 percent are related to incidents like that.

"We split the information into what we thought we needed in every case," she says. "I spent a lot of time thinking things like, 'Do I need a relation on every kind of death?' But it didn't make sense to do that when I could pull that information out of other files."

Now Chevrier has a file setup that allows her to enter the information she needs in every case, and only enter it once for each examination performed. If there is a fatality related to an auto accident, for example, the medical examiners will automatically perform a blood-alcohol test and a drug screen. That information is entered into the toxicology file along with the appropriate case number. But if there's no need for the tests, the file is never accessed. This saves storage space as well as time in entering information.

The real plus, though, is the ability to go from the demographic file to other files on an as-needed basis. "Say I need to know by race how many deaths were cocaine-related," she postulates. "I can pull the races from the demographics file and cocaine from the toxicology file and match the results with the case number for printing a report giving that piece of information."

Using a data-base management system isn't tough, as we've said, nor is it mysterious, as it seems to be at first blush. What's called for is a lot of skull work. You need to realize that you're going to, in a sense, model a real-life phenomenon—something that's real, that has hard information about it in existence. You build your data base by identifying information about the members of the group you're modeling, and then add descriptive information to your heart's content. You need to think about how you'll structure your files; whether you can put everything into one file, or if you need more files for a sensible arrangement; whether you'll need to relate information from one file to another, or whether you can solve your problem one file at a time.

Finally, you need to think about the need for your data-base application in the first place. Do I, for example, really need to automate my telephone log? Couldn't I just as easily record all the information on a piece of paper, and then use a calculator to figure out the elapsed time of the call? I could probably write in the name of the person I called, too.

I suppose I could do that, but what fun would that be, anyway? ⏹

## PERSONAL PRODUCTIVITY

### THE BOSS'S COMPUTER
data management. Not everyone is capable of such a transition, however, which—to put it delicately—influenced several personnel decisions made by the agency. And the impact extends to the hiring of secretarial help as well.

"Essentially, you try not to hire people who are intimidated by machines," says Schuller. "And you're no longer looking for someone who will be content just to file and type: You ask them if they like to be challenged. If they look at that green screen burning behind you and have to comment—'Oh, I see you work with one of those computers'—right away you say, 'maybe this is the wrong person.'" Schuller says you have to probe a bit, asking the secretarial candidate if he or she has ever operated a computer, or would like to learn how to use one, or if computers seem scary.

There are areas besides computing where the skills of a secretary partially displaced by a personal computer can be used, of course, but in any case management has to think about any change in the person's expectations resulting from the redefined position. Sometimes, as in the case of the secretary at Rockwell who became a junior programmer, there is a well-defined change in responsibility, status, and appropriate compensation levels. Other times, a secretary given new responsibilities may feel he or she deserves a commensurate increase in status and compensation. If such an expectation isn't foreseen, or if management feels the change in duties does not constitute a promotion, trouble certainly lies ahead.

After Jackie Garcia received her real estate license and began to work on developing new business, she expected a change in status that never came. "In effect, they changed my job description without changing my salary to reflect the increased respon-

sibilities, so I left," says Garcia. Her knowledge of the business and the investment made in her education probably would have made a salary increase far less costly than allowing her to leave.

Janice Blood, director of public information for 9 To 5, a national association of working women, says that similar situations exist in many business arenas, and the resulting discontent and associated problems are undoubtedly on the increase. Her organization often hears complaints about legal offices, for example, where a secretary's job has been broadened to encompass the duties of a legal assistant while the secretary continues to make much less than a legal assistant's salary. Raising clerical people to positions of higher responsibility is well and good, but it only makes good sense if you raise pay levels commensurately.

Even if all you've done is taken away a bit of typing and gotten your secretary trained to take care of some of the details of personal computing, don't think you haven't raised his or her prospects and expectations a bit. Robyn Sheehan, a secretary for Cahner's Publishing in San Jose, Calif., says she's happy where she is, partly because she does so much less typing now that personal computing has come to her office. But she's happy about learning WordStar, PerfectCalc, and how to troubleshoot the computers in the office for another reason as well: "When the time comes for me to look for another job, saying I know all this computer stuff will look a lot better on my resume than just saying I know how to run a Selectric typewriter," Sheehan says.

If you have taken on some clerical tasks in the interests of excellence and efficiency, therefore, and maybe even succeeded in figuring out how this affects the role your secretary plays in helping you get your job done, it might be wise to recognize her enhanced value, now that she's doing more than just typing. ⌘

## THE "IBM STANDARD"
*(continued from page 65)*

after all, is to increase personal productivity. If a machine is truly personal, compatibility is to a large degree irrelevant.

The point to stress about this discussion is that it is based on the guesses of other people about what IBM will do, rather than statements straight from the horse's mouth. IBM rarely talks about the future, while all of IBM's competitors seem to think a great deal about what IBM's future moves will be. What this means in the case of personal-computer standards is a bit sobering. The industry is not thinking so much about what is good for the consumer. Instead, it is thinking about what would be best for IBM, because what is best for IBM seems the most reasonable scenario for what will actually happen.

Microsoft's Larson tries to soften the impact of this dependence on IBM, however, by pointing out that IBM has to please its customers, you and me. The corporate investment in purchased and customized MS-DOS software is very large, he says, "which means the ante for IBM changing standards now has been raised considerably." Why would IBM risk angering its customers by making the large installed base of PC-DOS software obsolete? An acceptable excuse might be to give them something better, perhaps, but we only speculate.

Does this mean we've plateaued with the IBM Personal Computer and its operating system then? "I'd be the last person to say that," says Corona Data System's Lotito, who backs up his gut feel with 20 years of watching the computer industry continually advance. "I think we are on the verge of a leap, much like the move to MS-DOS, that is being brought about by new microprocessors."

Indeed, most industry pundits say that the next generation of microprocessors will lead to a battle of

single-user computers, networked to allow the easy exchange of information and sharing of expensive peripherals, pitted against multiuser systems in which four or more people have terminals connected to a single, shared computer. The purported advantage to multiuser systems in the business environment—lower cost per user—will be weighed against the disadvantages of performance degradation as more users are piled on, and the lack of individual control inherent in multiuser systems. This is the stuff that lead us to personal computing in the first place.

In either case, however, MS-DOS/PC-DOS in its 2.0 implementation doesn't cut it. It has no multiuser capabilities and it fails even in the network scheme, because for a network to be truly useful, the computers on the net must be multitasking, that is, they must be capable of doing more than one thing at a time to allow the networking software to run continually "in background" (a term which will be explained shortly). Moreover, the operating system must have hooks into the network. Together, multitasking and these hooks allow the user to transparently access resources and information on the network without interrupting his personal-computing tasks.

Microsoft has yet to clearly define the future shape of MS-DOS, but it is clear it will have to provide for the ability to do several computing tasks at once, if for no other reason than to catch up with Digital Research. "Even (Microsoft's chairman) Bill Gates said in his keynote speech at a recent trade show that next year the aisles of the show would be full of multitasking, networking computers," says Kevin Wandryk, product manager at Digital Research. "The difference between what Microsoft says and what we say, however, is that we have multitasking and networking today."

Indeed, the next operating system standard for personal computers could conceivably be a PC-DOS-compatible substitute, or at least the marketplace could be split between Microsoft and another company that offers PC-DOS compatibility plus some advantage. Certainly Digital

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Research is taking that tack with Concurrent CP/M-86 Version 3.1, which offers the ability to run most PC-DOS programs. Microsoft is faced with the task of completely rewriting MS-DOS in order to catch up with Concurrent, which allows the user to run more than one program at once and toggle between them with just a few keystrokes. This can be useful, for example, by allowing you to go on to another computing task while a large spreadsheet model is being recalculated "in background." In background simply means that the program continues to run even though you, the user, are currently using another program. This allows you, for example, to keep writing a report while your computer receives a piece of electronic mail or prints out a letter in background mode. Moreover, the Digital Research operating system allows these separate, multiple "tasks" to be displayed "concurrently" in separate windows on a single computer screen.
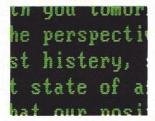
Chris Larsen of Microsoft declined to reveal details of the multitasking version of MS-DOS currently under development. (People in the industry have been calling it MS-DOS 3.0, although it will probably have some other name when it is finally made available.) But Larsen argues that Digital Research's Concurrent, for now, offers the user few real advantages in running MS-DOS/PC-DOS software. "I think you'll see the same problems with getting anything extra out of Concurrent that you would see in running old MS-DOS applications on a new, enhanced version of MS-DOS," he says. Even on a multitasking MS-DOS, he says, the new features of the operating system will not be transparently available to any MS-DOS application. "In many cases, you'll have to have new versions of the applications that 'understand' the extra functionality of the new release of the operating system."

Kevin Wandryk of Digital Re-

# How HP business graphics

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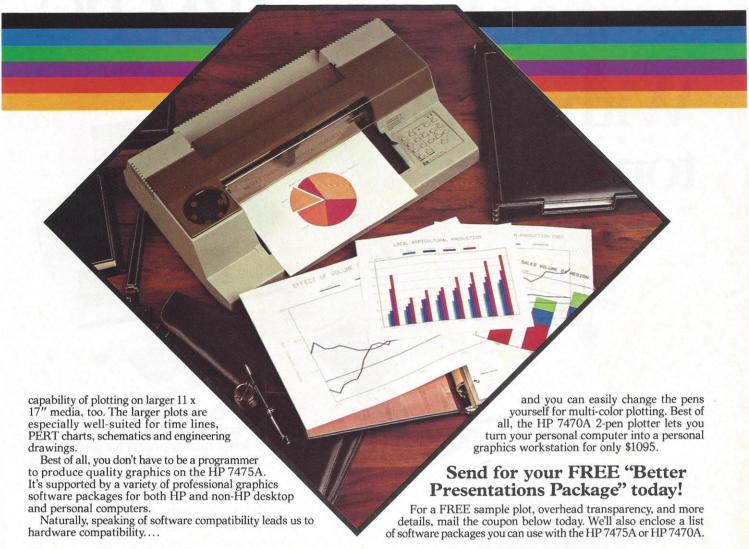
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## SPECIAL REPORT

search agrees, and brings it back to the deficiencies of the current standard. "Programs that go around PC-DOS and write directly to the IBM Personal Computer's video map in order to display characters or graphics on the screen will continue to do so when they go into background mode, which means information from that background program will appear and 'trash' your screen," he says.

In any case, a new battle may be shaping up over the networking and multitasking issues, which could wrest the current standards crown away from Microsoft and give it to Digital Research. "On the other hand, the next multitasking version of MS-DOS could pull enough things together to win," says Lotito of Corona Data Systems, which is supporting both Microsoft and Digital Research operating systems just to be safe. But remember that whatever multitasking operating system is chosen, application software may have to be re-written again to take advantage of the extra capability. Ah, the price of progress.

Even if we avoid the multitasking question and assume that doing one thing at a time will forever satisfy our personal-computing needs, it has to be pointed out that it is not clear just how much of today's single-user "standard" software running on the 8088 will run on tomorrow's "standard" single-user operating systems running on such chips as the 80286 (just plain 286 for short). Although the 8088 and 286 share the same basic architecture, there are differences even here that will cause problems. "Some of today's applications actually go down around MS-DOS and manipulate things right on the 8088," says Jim Lee, Intel's manager of software development for the 286. "Software that's portable across MS-DOS machines will probably run on a 286 once MS-DOS is implemented. But software that runs on PC-DOS and not MS-DOS may not." 🔳

## PEOPLE IN COMPUTING

Phelps wanted—especially since they decided to store most of the programming in the computer's memory, rather than on disk, to protect it from careless novice fingers. So they added another 64k of memory. Then another. And then 64 k more, for a total of 256k. A disk spooler was also added, to allow Michael to make use of all that extra memory; and an IBM color monitor and an Epson MX-80 printer completed the setup.

The energy programs, Phelps says, are "very interactive. You actually play with the computer." Even when no one is at the keyboard, the programs cycle through, attracting passersby with the colorful, moving graphics. And attracting an audience is what it's all about.

Mahany-Braithwait and programmer Phelps are shameless in their efforts to make the program as inviting as possible. With each new response from the public, the two plot revisions to make the programs even more appealing. "You cannot believe the changes the programs have undergone. We've been learning what the public is and isn't able to handle," Mahany-Braithwait says.

For example, they've discovered that seven to 10 minutes is the longest attention span they can expect, so they sped up the program a bit to squeeze in as much information as possible. They've included the color monitor to grab attention, they've deleted verifying questions such as, "Are you sure you want to do this?" and they've omitted a Help option because most people didn't use it, and those who did became impatient with its sluggishness. The protective case which houses most of the computer's workings is being redesigned to make it more obvious to casual observers that there's a computer inside. After all, Phelps says, "One of the draws for the project is the fact that it is a computer giving you the information."

Surprisingly, when a married cou-

## PEOPLE IN COMPUTING

ple encounters Michael in the hardware store, it is more likely that the wife will run through the program while hubby stands by and watches. Mahany-Braithwait surmises it may be that women are less afraid of answering a question wrong, hence more likely to give it a try.
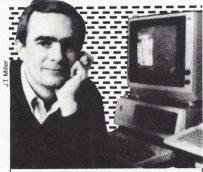
Reaching the handy, do-it-yourself homeowner has been a major thrust for the project. These people are thought to be likely to follow through with energy conservation measures—especially if their brains are jogged in the winter months, when it's cold outside and energy is on their minds.

But another group is just as important an audience—elementary school students. Michael heads for the classroom as his programs are being adapted for grades one through eight. Children will bring home questions about their family's utility bill; mom and dad's answers will be entered into the computer back at school. "We're hoping for upward peer pressure," Mahany-Braithwait says.

People really like the program, but they get frustrated when it doesn't work, "Printers are not designed for dropping objects into," she says—a problem they've encountered with keeping the system available in public places. "We'd like to get a mouse or a touch screen" she says—this would alleviate problems caused by people banging on the keyboard.

In spite of careless users, however, the project is proving to be an enormous source of pride for Palo Alto's utility department. "There is no one else out there doing anything like this," Phelps says. "All the programming, all the ideas are original. We're kind of a model for other utilities. We're catching the person on the street and trying to get them to think about energy, and we're getting them at the point where they're going to purchase energy conservation items. It's a great feeling of accomplishment to know you're really making an impact."

## COMPUTER CONSULTANTS

*(continued from page 90)*

try. They spend three to six months training people, and then their people say, 'Wait a minute, I can make twice this much on the outside,' and boom they're gone. That's happened to a couple of my clients. They brought people on board, they trained them, and then they saw them leave."

It's clear: Anyone involved in purchasing or using personal computers in a business environment had better become aware of what a microcomputer systems consultant is and what he does, because in an environment where more and more people who are not fascinated by the idea of struggling to make a computer do its job—people who aren't hackers—are getting computers, consultants are going to play an increasingly important role. As James Hare suggests, the key word in describing that role may be flexibility. No matter what stage you and your company are at in the process of incorporating personal computers into your business, a consultant can offer you valuable services. He can make initial recommendations on equipment and software purchases, he can write the templates you need for your spreadsheet and data-base applications, he can take charge of special projects like computerizing your budget or setting up a local area network, and he can even train your people so that his own services are no longer needed. In other words, he can take much of the pain out of computerizing your business, letting you enjoy the benefits of personal computers sooner and with far less resistance and fewer nasty surprises than is possible without one. That kind of help doesn't come cheap, but its cost is certainly much lower than the cost to your business when you bring in computer systems that don't work or that your people refuse to use. So, while it may sound odd in a field known as personal computing, it really is all right to ask for help. In fact, it makes sense. ∎

## HARD COPY GRAPHICS

Most major copier manufacturers sell transparency stock that is loaded into the copier just like regular paper. Instead of copying your image onto paper, it copies it onto an $8\frac{1}{2}''$ by $11''$ transparency. The transparencies can be inserted into cardboard frames for easy handling on an overhead projector. Of course, if your printer produces color graphics, you'll have to find a photocopier that reproduces the copies in color. Just to give you some idea of how cost effective this process can be, you would pay $0.80 per copy for Color Xerox on paper; $3.90 per copy for a Xerox Color Transparency (a box of 100 transparency sheets for copier costs $75.00); and $1.00 per copy for a B & W Xerox transparency.

While photocopiers suit the needs of many managers, others demand greater quality, immediacy, and impact for their presentations. To achieve this, they use color slides rather than transparencies or photocopies.

Slides are especially convenient when a large number of graphics will be shown. To do this once required outputting graphics onto paper, then shooting the slide. Some enterprising souls concocted Rube Goldbergesque arrangements to take pictures of the personal-computer screen directly, with light boxes or black velvet "tents" to prevent reflections. Because of the curvature of the screen, however, and because the computer's colors don't exactly match film colors, the resulting slide generally couldn't be used in a corporate setting unless accompanied by lengthy explanations excusing their quality.

In the past 18 months, though, the technology for shooting slides from a computer screen has improved, and a number of affordable devices have been introduced which can generate slides directly from the personal computer at a reasonable cost. In essence, these devices are interposed between the computer and the monitor. They read the video information directly and then, using a series of filters, expose film in sequence. Lang Systems's VideoSlide 35, for example, sells for under $3000. Slidemakers such as this will work with a wide group of video devices, not just personal computers. CRT manufacturers and camera makers are also getting into the act, producing flatter screens and special lenses, respectively, which compensate for screen curvature. Kodak even makes a special CRT camera with a hood, allowing the user to place it against the CRT and shoot.

Computer-generated slide-makers run anywhere from $1300 to $7100. Despite the cost, they've had a dramatic impact on audio-visual departments in large corporations, institutions, and universities. Tasks which once took weeks to accomplish at a cost of $30 a slide can now be performed in a matter of seconds.

Some industry observers feel that business graphics could be the next new wave—following spreadsheets, word processing, and data bases—to engulf personal computing. They point to the inclusion of graphics packages in popular integrated software packages and the downward trend of the price of output devices. Dr. Harold Kinne, vice-president of Future Computing, offers his opinion on the subject: "The price is coming down and the capability is going up, so it is a growing market."

Many graphics output devices, printers, plotters, and slide-makers produce impressive results. However, consumers must take the same common-sense approach to these machines as they take to every part of the computer system. The first questions must be: What problems will the machine solve, and what tasks will it be put to? Keeping the compatibility issues in mind, these questions will allow you to determine which type of output device best suits your needs.

cursor-control keys on the IBM keyboard, you move the arrow until it points at the disk you want to see. Then you look at the top of the screen, where a menu is located. The first item on the menu is Zoom, which means you want to zoom in on the disk you've selected, in much the same way that a zoom lens on a camera moves in on its subject.

Other menu items are Find, Copy, Erase, Print (a catalog of the disk you're pointing to), Rename, Setup (your hardware so the program knows what it has to work with), and Quit. In effect, Jack2 obviates the need for its user to learn the MS-DOS operating system; everything you're likely to need is in the opening menu. Press Z for Zoom, or use the left- and right-arrow keys to move to Zoom on the menu and press Enter, and you see the next screen—a picture of envelopes.

"Envelopes are things you put documents into," says Dziejma. "They're like file folders." On the right of the screen is a small picture of a floppy disk with its name— Rabbit, in this case—printed on it. That way you know

what file you're in. On the top of the screen is a menu similar to the one that got you here: You can Zoom, Find, Copy, Erase, or Rename. Once more, you can move the small arrow to select the envelope you're interested in, using the up and down cursor-control keys.

Dziejma moved the cursor to a blank envelope, and zoomed. The program politely informed us that there were no forms in that envelope, and asked for a file name. When Dziejma supplied a name—Frog—the envelope was instantly called Frog. Now, having named the file, zooming Frog took us to the program's worksheet.

### The worksheet

When you enter the worksheet, you see a screen with a ruler line along the top. A menu appears above that, listing the options Insert, Alter, Erase, Locate, Replace, Margin, Highlight, Copy, Field, Over(ride calculation rules), and Save. Again, simply use the right- and left-arrow keys to select a menu item. You can distinguish between the items because the one you are using appears

## GEMS OF WISDOM

### Manipulating Your Spreadsheets

**W**hen working with the Lotus 1-2-3 program on my IBM Personal Computer, I find it awkward to insert or delete a row in a range of spreadsheet columns. Using range erase followed by the Move command is cumbersome, and, for me, is likely to produce errors, especially when more than one column is involved. The Worksheet Insert Row or Worksheet Delete Row commands are elegant, but, inasmuch as they cover the entire row (including all columns), they could inadvertently alter a column out of the desired range.

Instead, I find it more convenient to use the Move command to get the desired range out of the way. I place the range in row 1000, since I have no columns that long. I can then use the Worksheet Insert Row and Worksheet Delete Row commands freely. When I finish editing the range, I move it back to its original position.

*Michael S. Cahan*
WARRINGTON, PA

*This Gem of Wisdom wins $25 for Michael S. Cahan. If you have an anecdote, tip, or secret to share, send it (up to 250 words) to Gems of Wisdom Editor, Personal Computing, 10 Mulholland Dr., Hasbrouck Heights, NJ 07604.*
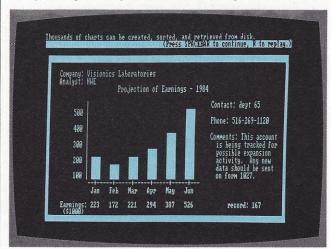
## PRODUCT REVIEWS

in inverse video. Once you've selected a menu item, a short explanation of its function appears under the menu to help you decide if you really want it or not. We chose Insert, which brought us to a screen in which the *real* business gets done.

It looks like a word-processor screen, and indeed you enter information into it as you would into a word processor. It has all the standard word-processor functions—Replace, Insert, Global search and replace, Automatic word-wrap, and the like. It also has a function that most word processors don't—you can have more than one column of text on the screen at a time. Dziejma showed how he could define one column of text at about 30 characters, and another—to the right of the first—at about 150 characters. The screen goes out to 188 character spaces; it scrolls past the display's default 80-character width so you can see your entire worksheet.

To start off, Dziejma entered text in 80-column mode for a few lines. Then he went back to the menu by hitting Escape, and selected the Margin option. He selected two margin limits by moving the cursor to where he wanted the limits to be, and entering a left or right parenthesis to indicate the left and right limits of his column. The left-hand column was 30 characters wide, and when we went back to the Insert mode, all the text that had previously been in an 80-column width was now set in the 30-column width. Furthermore, entering new text produced turnstile wrapping at the 30-character margin. Hitting the Tab key got us into the right-hand column, where text could again be entered up to the right-hand margin with turnstile wrapping.

Unless you like to see things in narrow columns, or you need to manipulate text in columns, rather than in lines, you might think this is only a gimmick—but this feature really does provide you with more utility.



**Graphs can be created with information from Jack2's spreadsheet. Changing spreadsheet information will change the graph.**

The multiple-column capability lets you put more than one kind of output on the same sheet of paper. Dziejma demonstrated this capability by tabbing to the right-hand column, entering the word Sales, and then—leaving the cursor where it was—choosing the Field option from the menu. Every time you pick an option from the menu, Jack2 greets you with a submenu. In the case of the Field option, the submenu lets you pick the kind of field you want—line, column, or graph. If it's a line, then you select the number of cells you want in the line. A field imbedded in a form letter, for example, would have one cell, for which you can specify the number of characters. A field for a spreadsheet, on the other hand, might have 12 cells—one for each of the 12 months of the year.

The fields can use entered data, or you can define a calculation rule (formula) for the field. Dziejma didn't define a calculation rule for this field, showing the program that he would enter data for it. Then he moved his cursor down one line, and entered the word Cost. After defining the number of cells and the width thereof, he defined a calculation rule for this field: SALES*.03. Then he moved down another row, entered Profit, and defined it as Sales-Cost. After filling in the sales figures in the top field, and hitting the Recalculate key, cost and profit figures were calculated from the values in the top field.

### Pretty pictures

Moving below the spreadsheet he had created, Dziejma created another field, which he defined as a graph in the Field submenu. Now another submenu appeared, asking for the type of graph, and its width and depth. After the information had been entered—he chose a bar graph—the graph appeared on the same screen that contained the document and the spreadsheet.

All the parts of the screen are linked. That means you can specify a graph of data that appear in your spreadsheet, and as you change the numbers in the spreadsheet, the graph changes. Axis labeling changes also, to account for changes in the figures being graphed. Also, if you have prepared a document that uses calculated fields from the spreadsheet—a letter to branch offices, perhaps, citing the offices' sales for a quarter—changing the sales number in the spreadsheet causes a change in the number contained in the letter. If there's a graph on the sheet, too, the graph changes at the same time all the other results change.

Jack2 comes in two parts, Jack Tutor and Jack2. The first part contains a disk that leads you through a tutorial plus a manual that explains the program's functions. The second part contains a user's manual and the program itself.

Jack2 is available for the IBM Personal Computer with 128k of RAM and two disk drives. It costs $495. Addi-

tional products for Jack2 include Jack2 Report, which does statistical handling and report generation, for $250; and Jack2 Utilities, which allows Jack2 to interface with the outside world.

**FOR MORE INFORMATION:** BUSINESS SOLUTIONS, INC., 60 East Main St., Kings Park, NY 11754; (516) 269-1120

### THE BUSINESS-FORMS DATA BASE

*by Lee The', Associate Editor*

**W** hen your biggest account makes a two-second phone call to find out what happened to the shipment he never received, does it take you two *days* to sort through the piles upon piles of records, files, and folders to find the information you need? And, while you were looking, did you find last Monday's lunch under a pile of papers you thought you'd given to someone to file away? When you find yourself in the throes of despair each time you try to organize the piles upon piles that seem to grow larger every day, don't despair. Don't eat the lunch, either—but don't despair. Now you have VersaForm— Applied Software Technology's data-base file manager that can help you organize all of your paper forms into a computerized data base that's easy to operate, and even easier to maintain.

VersaForm can help you get out of the trouble you have keeping track of ledgers, records, bills, reports—anything you normally keep on paper. You simply take your report (or any other form), copy the form onto the computer, and enter the data just as you would have entered it on the paper form.

VersaForm was designed to excel in such applications as: *Accounting and Financial*—invoicing, accounts receivable and payable, expense records with account distribution, cash receipts journal, and investment records; *Sales and Marketing*—order entry, quotations, sales analysis, and commission tracking; *Jobs and Project Control*—estimating, job costing, time cards and labor accounting, and work-order tracking; *Professional*

*Services*—time and billing records, expenses on behalf of client, and event scheduling; *Control of Merchandise and Materials*—purchasing, inventory, parts list, and shipping documents; and *Names and Organizations*—client membership records, mailing lists, and personnel records.

Setting up the program to meet your needs is as easy as designing the appropriate form, adding any desired error-checking measures (which are optional), and designing the output format(s) you want (for form printing and reports). Once you've done that, it's a simple matter of building, maintaining, and using the files.

As easy as it is, many managers find it difficult to set aside the time they'll need for the initial set-up process—even when it's as straightforward as it is with VersaForm. So, AST is producing a line of applications templates containing the entry form, output form, and report templates needed for a specific purpose. They're nothing you couldn't design yourself, but when time and trouble count, these templates can be a godsend. Templates currently available include: Legal Office Manager, Purchase

Order, Invoicing, Mailing List, Cash Receipts Journal, Expense Journal/Distribution, Job Cost ... Labor/Material, Check Writer, Medical Billing and Medical Insurance Claims. Later in the year, templates will be available for Personnel/Human Resources Administration, Inventory, Manufacturing Parts List and more.

But whether you use one of the templates or not, you still have to put in *some* uninterrupted time setting up VersaForm. *Personal Computing's* West Coast staff uses VersaForm to maintain its editorial file system. We installed it on an Apple II Plus with a Mountain Computer hard disk drive not expressly supported by AST. This installation was the hardest part of using the program, because VersaForm is written in Pascal, and Pascal-based software tends to be fussy about all the components in an Apple computer system; because the hard disk's manual was missing needed information about installing applications software under the Pascal operating system; because AST and Mountain Computer both really had to dig to find out just what was needed to mate their products; and

because the Apple version requires some conversance with the Pascal operating system's idiosyncracies (the PC-DOS/MS-DOS versions operate under PC-DOS and MS-DOS).

On the other hand, the installation of the floppy disk version of VersaForm on an Apple II Plus took just two hours to the point of filling in forms.

The MS-DOS and Apple versions working on standard, AST-supported hardware shouldn't take more than two hours to copy all the copyable program disks (one is protected—you have to send in your warranty card to AST for a backup), initialize some file disks, go through the Hands-On Exercise (which has you set up a simple file and trot through the main functions of the program), and start designing your own file system.
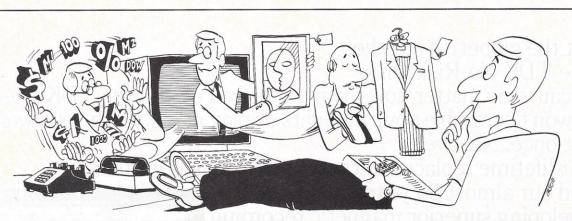
Even with our difficult installation, the main problems weren't really the fault of the program itself. Once we figured out how to get VersaForm mounted on our hard disk, the operation went quite smoothly, and the end result was a file system that works wonderfully well.

The Apple floppy version requires five disks to get such a big program into such a little computer (in terms of RAM and disk capacity). That means much floppy-swapping, unless you have three drives. Even then you have to do some swapping. And only the Apple hard disk and PC-DOS/MS-DOS versions give you a single primary command menu; the Apple floppy version splits it up among the appropriate disks.

### Getting down to business

When you boot up the program, the first thing that appears is a function menu, which lists all of the functions of the system: Form Design, Filing, Report, Design a Print Format, Copy or Print Forms, Mailing Label Printer, VersaForm Utilities, and Return to DOS. (I skipped the tutorial and, using the manual as a guide, got right down to business.)

You are then prompted to enter your choice. I chose Form Design, and pressed Return, after which a Form Design Menu appeared, giving me the options to Design

Pressing the question mark lets users view the above Help screen, which provides a quick reminder of VersaForm's functions.

a new form, Change an existing form, Copy an existing form design, Add or change checking and automatic filling, Print the form, or Return to the main menu, where I could select another function.

I chose option 1, Design a new form, and pressed Return. The program then asked me to give a name (of up to eight characters) to the new file that will be created once the form is designed; I labeled it "Personal" and pressed Return. I then went on to design my form on-screen, with no more trouble than it would have been using a word processor.

Designing a form is easy: You set up item labels, and rows of dots or inverse areas (depending on your computer) establish the space allocated to each item. Disk storage space is determined by the form design, not the actual amount of data. So be sure you need the space you allocate to each item, because it will reduce the total number of forms you can have in each file. Designs can include single items to be filled in as well as column headings.

Form design includes much error-checking, but you don't have to learn the software's limits—it will tell you where and how you've exceeded them. For example you can't give the same name to two items in a form. This means you can label the line on which you enter a client's name with the word "Name," but then you can't use Name as the label for the line on which you enter the name of the client's company. When an error such as this *is* made, the program flashes a message across the screen, then gives you the opportunity to either go back and make the change or cancel the form design.

If you get stuck at any point, simply type " ? ", and instructions pertaining to where you are will be displayed. Finally, after you and VersaForm agree that the form

## GEMS OF WISDOM

### No Need To Swap Disks

I use an Osborne 1 computer with CP/M, and chose WordStar for word processing. Recently I added the Spellguard program, and copied the files from the Spellguard disk onto my working copy of WordStar. I wanted to be able to switch between the two programs without swapping disks. The odd result was that whenever I cold booted the disk, Spellguard came up first. I then had to exit from it and boot WordStar, which was frustrating and wasted a lot of time.

Finally, I discovered what was wrong, and found a solution that brought WordStar up first. Among the files I had copied from the Spellguard disk was the Spellguard AUTOST(art) file. That file, which automatically starts Spellguard when you boot the disk, overwrote the WordStar AUTOST(art) file, and resulted in Spellguard becoming the "boot" program. So, all I had to do to fix the problem was replace the AUTOST(art) file on my working disk with the AUTOST(art) from the master WordStar disk. Then whenever I booted my working disk, WordStar booted. My problem was solved, and I could switch over to the Spellguard program right from WordStar when I needed it.

*John E. Jordan*
TORONTO, CANADA

*This Gem of Wisdom wins $25 for John E. Jordan. If you have an anecdote, tip, or secret to share, send it (up to 250 words) to Gems of Wisdom Editor, Personal Computing, 10 Mulholland Dr., Hasbrouck Heights, NJ 07604.*

# IF YOU'RE AUTOMATING YOUR ACCOUNTING SYSTEM FROM ONE-WRITE,



Sales Journal — March, 1983

| | Date Ordered | Customer Name | Customer No. | Salesman | Description |
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| 2 | 3/2 | Smith Electronics | 060 | Smith | Miscellaneo |
| 3 | 3/3 | Computer Products | 100 | Jones | Parts |
| 4 | 3/3 | Dane Assoc. | 040 | Kane | Parts |
| 5 | 3/4 | Overview Inc. | 010 | Kane | Miscellaneo |
| 6 | 3/5 | Ace Electronics | 102 | Smith | Electronics |
| 7 | 3/5 | Ace Electronics | 102 | Smith | Electronics |
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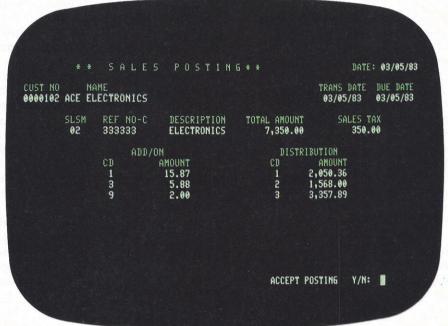


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    SLSM   REF NO-C   DESCRIPTION   TOTAL AMOUNT      SALES TAX
    02     333333     ELECTRONICS    7,350.00           350.00

             ADD/ON                       DISTRIBUTION
        CD      AMOUNT                 CD       AMOUNT
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        3         5.88                 2       1,568.00
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HAYDEN SOFTWARE

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meets both your needs, you store it. Then you can start filling it in and building your file system manually. Or, you can use the checking and automatic filling option.
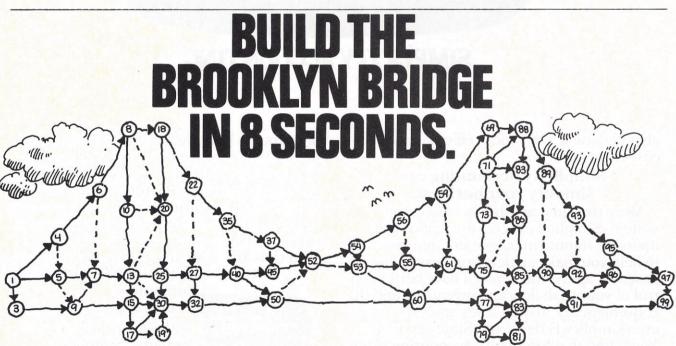
What this means is that you can have the system automatically fill in items for you—you simply select the items you want it to fill in. It may seem like a rather frivolous option, but actually it saves time and reduces the chances of making mistakes which could be made if you entered the information yourself.

So, to avoid errors, you can—for any given field—have VersaForm check for things like: minimum and/or maximum number of characters or size of number; requiring numbers rather than letters; accepting yes or no entries only; specifying date formats; requiring an item to be filled in before VersaForm will accept the form into the file; checking entries against a list entered into the file; and details of item format.

Given the amount of diligence and attention span of most people, this helps save the enormous trouble of error-hunting. Automatic filling also helps ensure accuracy by automatically looking up data where needed. For instance, you could enter a part number and the program could find and fill in the part name and unit price—and even total anything you specify.

If you decide you like the way the form you've designed looks, and you want to use it again for something else, you can just pull up the original form and use it. You can also copy data from one form to another, as long as the item name and other factors (like length of space available for the item listing) match. This makes it possible to revise forms without rekeying data, even after the file system has been built. And, of course, both the form design and individual forms can be printed out, with or without the item headings.

Whether you currently use a hard disk or not, the odds favor you getting a multimegabyte capacity storage device of some sort within a year of setting up any kind of serious file system. One of the reasons we liked Versa-Form was the fact that we could use it on our computers

with or without hard disks, and still have compatible files. It even lets us maintain files that span more than one diskette's capacity. And once you've gotten your file system on hard disk (or an equivalent device)—you'll never go back. It's not just the file size possible (up to 4,000,000 characters per file with VersaForm)—it's also the speed of file access and simplicity of use.
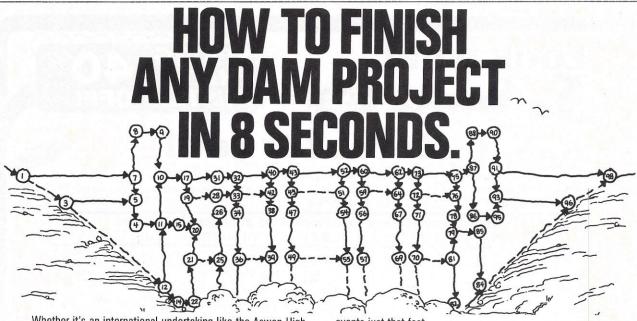
## Two kinds of printouts

VersaForm prints out data in two ways: as reports, and as forms (including mailing labels). The reports, in columnar form, let you analyze data from the files using standard Boolean algebra operations like equals, greater than, less than or equal to, etc.

You can sort and total figures, too. For instance, the Legal Office Manager template includes a report format that lets you report fees by case and attorney—with totals. You also get report formats for Accounts Receivable by Responsible Attorney, Accounts Receivable by Case, Accounts Receivable by Balance Forward Data,

Hours and Fees Recorded by Attorney, and Index and Cross Reference. You can do the same thing for your own applications, too, and save your report formats just as you do your file formats.

Report formats can work with up to nine selection conditions (items on your form), with up to three conditions applied to each of the nine selection conditions. So, you could make one of the nine selection items a customer's city, then add the additional qualification that the city will only be printed on this particular form if the state listed on the same form is either TX or NV. Your reports can also sort by specified alphanumeric parameters, and give you subtotals and/or totals. If your report has a lot of columns, VersaForm will automatically slide them halfway over each other, and print the appropriate data on alternate lines. It will also print a columnar format up to 200 characters wide if your printer will support it.

Our experience with VersaForm leaves us with the opinion that if you're willing to put in the time to set up your system, you'll love what it can do for you. But one word

of warning: Don't try to set up a system in a slapdash manner. Take your time, and take advantage of all the help the program provides. Setting up a system is easy—but if you don't put good, smart thinking behind what you want to do, VersaForm can make you feel as if you're traveling on one of those super highways where missing the right exit ramp requires a five mile detour. But, again, it's hard to go too wrong, because so many checks are built in.

The newer PC-DOS/MS-DOS version works more smoothly than the one we used, and the ability to search on any field makes the program a lot more versatile.

Compared to other file-management systems, this one lives up to its claim that most professionals can get the hang of it without too much trouble. And it even has a special feature for good programmers: an optional Pascal interface to let you modify the program.

VersaForm runs on the Apple II, IIe and III; Columbia MPC; Compaq; Corona; Corvus Concept; Eagle PC and Spirit; IBM Personal Computer and XT; and Texas In-struments Professional. AST has also stated that it is preparing mouse-oriented versions for Apple Lisa and computers using VisiCorp VisiOn. All versions require 80-column display and two disk drives—double-sided in the case of PC-DOS and MS-DOS machines. All versions require 128k RAM except for the Apple II/IIe version, which requires 64k.

Suggested retail price for most versions is $389. Up-grades to Release 2.7 are available for $75 to owners of earlier versions of VersaForm on PC-DOS/MS-DOS computers. The hard disk version for the Apple II, IIe, and III costs $495. The Pascal programmer Interface costs $245. Application template costs: Legal Office Manager, $249; Purchase Order Application, $49.95; In-voicing Application, $49.95; Mailing List, $39.95; Cash Receipts Journal, $39.95; Expense Journal/Distribution, $39.95; Job Cost . . . Labor/Material, $79.95; Check-writer, $39.95.

**FOR MORE INFORMATION:** APPLIED SOFTWARE TECHNOLOGY, 170 Knowles Dr., Los Gatos, CA 95030; (408) 370-2662

CIRCLE 198

# Computer Source Books
# For Your Library

■ Computer Wimp
■ Are Computers Alive? ■ Genesis II

## From The Depths Of Computer Despair

**COMPUTER WIMP**
JOHN BEAR, Ph.D.
TEN SPEED PRESS
BERKELEY, CA
285 pp., $9.95

Ten Speed Press is well known for its practical, step-by-step self-help books such as *What Color Is Your Parachute?* and *Better Letters.* John Bear's last book for Ten Speed, *How to Get the Degree You Want*, was also along these lines. Once more Bear and Ten Speed have teamed up to provide sensitive, practical help to the hapless souls who have been—or are about to be—deprived of their self-esteem and confidence, and turned into what Bear calls "computer wimps."

Despite its fairly frivolous title, *Computer Wimp* is a very serious book. After dealing with small computers for nine years, Bear wanted to share his experiences, and hopefully protect other unwary people from the fate he suffered at the hands of the computer world. He has compiled—mostly from his personal experience—a compendium of the frustrating experiences the computer world has to offer, and what can be done to prevent them; or, at least, how to cope with them without losing your sanity.

Bear gives us a witty and intelligent look at why such a simple machine as a personal computer should inspire such fear and anguish. The personal computer is a labor-saving machine just like the automobile (an analogy which recurs throughout the book). As Bear puts it, "Why should an intelligent, manually dextrous, communicationally proficient human being regularly be turned into a quivering, angry, frustrated, despondent computer wimp, when all he wants to do is drive the damned machine." Does this mean, then, that if automobile owners—plagued with near unavailability of replacement parts and service, incompatible operating systems (some early cars were steered by foot pedals, and for a long time the hand brake was the only way to stop the car), and an "I don't care" attitude on the part of the manufacturers—would be afraid to drive around the block, there would be books written about "Automobile Wimps" as well?
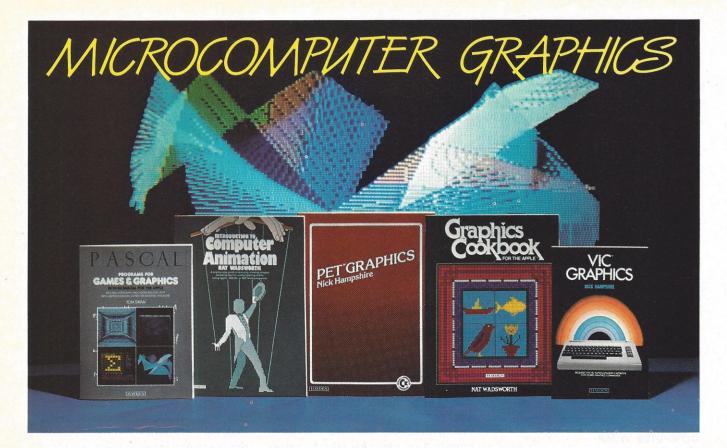
The book is subtitled "166 things I wish I had known before I bought my first computer." Indeed, scattered about the margins of the book are 166 little aphorisms (numbered for easy reference), neatly summarizing the adjacent paragraphs. These range from the introductory "'Driving' a computer should be as easy to learn and do as driving a car—but rarely is," to the classic "Always copy all disks and tape and always store the copies somewhere else. If you only do this 99% of the time, then the 100th time will be the time that amazing events happen and you will lose all your data."

Amazing events occur throughout this book, the most amazing being that they are fairly commonplace in the computer industry. For instance, when computer chips loosen enough to cause malfunctions on the way home from the repair shop, what can you do? Bear's answer: "Never buy anything you can't lift." Then there's always the problem of coping with the fact that by the time a computer comes to market, another, cheaper and technologically superior model is announced, and when it's available, still another, cheaper and more advanced machine is announced, and. . . . "Never be the first on your block to buy anything new," Bear warns.

Beginning with making the decision to computerize ("Not computerizing at all is a valid alternative to having your own computer"), and proceeding through shopping, buying, finding reasonable service, and dealing with shoddy merchandise, Bear takes you through all the pitfalls you're bound to encounter. Many people buy a computer first, only to discover later the quirks of life in the computer world. These involve challenges and excitement for some, but intimidation and despair for others. Reading this book could make the difference for you.

Like Bear, I feel that " . . . if I had had this book before I bought the first of my four computers, I would have saved at least $50,000, thousands of

hours of my life, and probably staved off at least four attacks of gout." It's too late for me, but if you're thinking of buying a computer or considering trashing the one you've got, read this book first. There may still be hope.
—*Orlan Cannon*

## Is It Time To Redefine Life?

**ARE COMPUTERS ALIVE?
EVOLUTION AND NEW LIFE FORMS**
GEOFF SIMONS
BIRKHAUSER, INC.
BOSTON, MA
212 pp., $22.95 hardbound,
$14.95 paperback

**A**re computers alive? Let's eliminate the suspense and go right to the end of the book, where we learn that "We will soon not be asking whether computers and robots are alive, but what sort of life they represent . . . . Would you let your daughter (or son) marry a machine . . .?"

Hold it, hold it, maybe we did move a little too fast there. Before we insist that the home computer sleep in a room by itself, perhaps we should start over again and see how the author, an employee of the National Computing Centre of England, arrives at such a provocative conclusion.

On the very first page, we find Simons proposing that "computers and robots, appropriately configured, can be properly regarded as emerging life forms," an idea with "compelling support in theoretical argument and empirical evidence."

There's not much ambiguity in that opening fanfare, and one can almost admire the way Simons boldly states his mind and resolutely sets forth to drive his beliefs home. He even shares his battle plan with the reader, whom he has targeted for persuasion: In the first chapter, he will prove that "the most reasonable defi-

nitions of life admit the possibility that certain types of artificial systems may be alive"; further on, he promises, he will show that "machines are not only evolving limbs, senses, and brains, but also minds . . . ." He promises to confront the counter-arguments forthrightly.

And he does. Simons is honest in his approach and thorough in his documentation, but he utterly fails to persuade. He cites numerous expert opinions but treats them uncritically, and he does not seem to realize that overdependence on authority can render an argument trivial.

For example, he lists attempts by various thinkers to define the necessary and sufficient criteria of "life," and then shows that at some time, under some circumstances, some machine has met each of these. Of course the easy objection is that no matter how lenient the set of criteria, no type of machine has ever met all of them at once.

But Simons does not seriously discuss the deeper issue: Why can't thoughtful people agree on a definition of life? As Simons hints in his treatment of viruses, the real issue is where to draw the line—and whether a line can be drawn at all. If it can't, "Are computers alive?" becomes a meaningless question. And Simons never tells us what he personally thinks life is.

Having failed to prove that machines are alive (or dead, for that matter), Simons moves quickly to the subject of intelligence. In fact—though obviously he doesn't have to prove that they are alive—he devotes most of the book to intelligence. An amoeba is incontrovertibly alive, but what sort of extremist would claim that it is smart?

Simons never seriously looks at the flip side of the coin, either. Carl Sagan has compared the intelligence of a Viking Mars Lander to the intelligence of a grasshopper (which it somewhat resembles, allowing for difference of scale), but neither

Sagan nor anyone else would suggest that Viking Landers are alive.

Many machines exhibit intelligence, sometimes primitive, sometimes highly sophisticated, usually tightly specialized. Chess programs, for example, are capable of defeating human masters, but are useless for anything else. Ditto for "expert systems"—a program that can diagnose a psychiatric patient cannot begin to know where to drill an oil well, nor does it know how to find out. (Perhaps it could if it really "wanted" to.) These programs show no tendency to reproduce themselves spontaneously, nor to protect themselves from discomfort.

Does life, as well as intelligence, reside in software? Not yet. Neither the programs nor the machines they run on are in any sense alive.

Enough of cerebral matters; let's get physical. When discussing human response to computers and robots, Simons shows a rather charming (and somehow very British) tendency to get tangled in speculation on the sorts of kinky sex intelligent robots could indulge in, not with each other but with us. In Michael Crichton's film *Westworld*, female-type robots in the amusement park do whatever their male-type human clients request (vice versa for male robots and female clients). The movie didn't go into psycho-mechanical detail, but Simons does—at length. His discussion does nothing to illuminate the question of machine life; however, it can't help but sell the book.

Make no mistake, *Are Computers Alive?* is not only an entertaining book but a serious one as well. It addresses questions of real interest, addresses them knowledgeably, and provides a valuable reference and guide. It fails to make its case, but that hardly detracts from its worth. This is the sort of book one likes to talk back to—a good sign of the author's very human liveliness and intelligence.
—*Paul Preuss*

# In The Beginning . . .

**GENESIS II,
CREATION AND RECREATION
WITH COMPUTERS**
DALE PETERSON
RESTON PUBLISHING CO., INC.
RESTON, VA
224 pp., $24.95 hardcover,
$15.95 paperback

Watch out. Don't let this one go by without at least a second look. Despite the dumb title, despite the publicity which describes this book as "a true 'collector's item,'" and despite its spacey organization and the rather arbitrary selection of its contents, *Genesis II* has many good ideas, a few good pictures, lots of good information, and much entertaining prose.

The book is about creation with the computer, about computer art. For purposes of this volume the author has chosen to concentrate on "Creation in Light," in "Sound," and in "Recreation." Stated less grandly, that's pictures, music, words, and games.

Games? Games as art? An argument could be made that some computer video games are an expression of their creator's art, perhaps even a new and original art form in themselves. Dale Peterson starts to make this argument, but falls far short. "Games are a form of art," he asserts. "Call them participatory art."

"Don't tell me what to call them," I reply: "Prove it."

He trots out computer chess, checkers, and backgammon as examples.

"This is art?" I ask.

He ripostes by discussing the 1962 creation of the game Spacewar.

Granted those M.I.T. hackers actually created something new, but was it art?

Now as the saying goes, if you have to ask, it's art. And right here is where Peterson might possibly have

won me over by talking about three-dimensional simulated kinesthetics or some such (don't press me for explanations, it's not my book)—yet sadly, at this point he seems to lose interest, and begins to simply synopsize Adventure, Three Mile Island, and games like that. If it weren't for a final reference to the kind of interactive fiction made possible by computer memory, the book would just fizzle out, for the section on games is the last section in the book.

But a tantalizing mention of the computer novels of Robert Lafore, literally dropped in parting, may lead the reader back for another look at the section on "Creation in Symbol." If you read all the way through this section to the discussion of Scott Kim's magical calligraph, you'll be led back to the "Creation in Light" chapter—and so on. The recursive gimmick is obvious, but it works. Following Peterson's allusions will keep the reader pondering the blurred edges between traditional and new art forms.

Peterson is an erudite writer with a gift for introducing a subject at its most easily comprehensible level. His explanations of how computer graphics systems work, how sound and music systems work, and how poem-writing and story-telling programs lurch along are among the clearest popular expositions to be found. His passages of historical background—for example, on mechanically inclined visual artists from Leonardo through the Italian Futurists to the neo-Dadaists—are judicious and instructive. His esthetic judgments are less sound, and Peterson put a lot of pressure on himself when he set out to prove that computer-assisted art is unique and worth serious attention.

Music has to be exempted from the discussion. One simply can't tell anything about computer music (or about any other kind of music that isn't already familiar) from a book. Music is immune from translation to non-musical media. Those who've

been exposed to contemporary computer-assisted compositions know that some are exciting, unusual, and thought-provoking, while some are just OK, and the rest are harsh, ugly, boring, and incomprehensible. But new music is always strange; writing about it is thankless and perhaps even useless, except to exhort the reader to go out and listen to important new artists such as Laurie Spiegel.

As for the verbal arts, most of the computer-generated stories and poems presented here are laughable, sometimes delightfully so. The delight is purely voluntary, one-sided, a matter of human response. Here the reader may be tickled by a provocative juxtaposition of concepts of which the computer has not the dimmest comprehension: "Stiff is music/ And deep are the steeples of its caress." That line from Marie Boroff's "Five Poems from the Chinese" is unsettlingly beautiful, though it means nothing at all.

Only in the realm of the visual can the reader confront art that has a clear claim to the title. Peterson includes a number of computer-generated line drawings and eight pages of color plates; each of the artists represented makes unique use of computers. Nevertheless the works displayed seem, with one or two exceptions, banal and derivative. In some cases the computer clearly saved the artist a lot of trouble; in other instances the contribution of the computer is invisible and arguably unimportant.

Dale Peterson would like us to think that computers have irreversibly altered the cultural and esthetic sphere in which we are immersed. He may well be right—he probably is right—but on the evidence presented in *Genesis II*, the day when we can actually notice the difference is still far off. Meanwhile, this book affords a useful if rather unstructured peek into the art world of the future.

—*Paul Preuss*

# Local Area Networking—An Industry Perspective

Linking personal computers to each other or to mini- and mainframe computers through local area networks is an exciting and controversial field which is developing rapidly as more companies begin to explore its potential.

Networks use cable, hardware-expansion boards, and most importantly, software to link personal computers and other office equipment. Electronic mail, transfer of files, sharing applications software and hardware such as laser printers, or accessing information in larger, mainframe computers are just a few of the uses for networks.

Personal Computing assembled a panel of authorities from a range of companies for a round-table discussion of these issues, held in Las Vegas, November 29, 1983. Their comments, excerpted and edited, shed insights on this complex subject. Topics examined range from how to cope with rapid obsolescence, to the frequent failure to gauge the need for technical support, to what the panel described as "IBM paralysis."

The participants who joined Personal Computing's James E. Fawcette, executive editor, and Charles Rubin, associate editor, for this discussion were:

John Shoch, president, office systems division of Xerox. Shoch is involved in the installation of major office systems linking personal computers, word processors, and other office equipment in Fortune 500 companies, a major product line for Xerox.

Robert Metcalfe, founder and chairman of 3Com Corporation and the inventor of Ethernet, a system of hardware and software used for linking computers. Ethernet is sold by Xerox, 3Com, and other companies.

Ron Yara, marketing manager of Intel Corp.'s OEM (original equipment manufacturer) communications operation. Intel manufactures the 8088 microprocessor that is the heart of the IBM Personal Computer and most of the Personal Computer's



**"**Network use is growing rapidly.... I think the bottom line is 'Buy now.'**"**
—Robert Metcalfe

Photos by Bob Foothorap/Black Star

imitators. The communications operation designs and manufactures complex system boards used by other manufacturers.

Charles Morrow, chairman, Morrow Decisions. His company sells low-cost personal computers.

Darrell Miller, marketing manager for operating systems, Digital Research, Inc. DRI supplies the CP/M operating system used on approximately two million CP/M computers and sells the CP/M-86 operating system that competes with PC-DOS and MS-DOS in the 16-bit personal-computer market.

Charlie Bass, vice-president, Ungermann-Bass, Inc. Ungermann-Bass provides networking services.

Marc Warshaw, formerly network product manager, Corvus Systems. Corvus is a leading manufacturer of low-cost networks.

Tom Quinn, president, Santa Clara Systems. SCS supplies computer networks.

David Ferris, chairman, Ferrin Corp., a San Francisco-based consulting group.

**Thousands of users are turning to local area networks to meet their companies' communications needs; according to one industry study, over 13,000 local area networks have been installed. But users face a confusing array of questions and problems. Numerous proprietary networks are available that work with some hardware and not with others. Technology is changing rapidly, causing fears of obsolescence. Compatibility with both hardware and software is an issue. What is the status of local area networks today?**

**Metcalfe:** Network use is growing rapidly. As you posed your question, I looked around the room at your forum participants and, from what I understand of their successes, count substantially more than 13,000 installed local area networks here alone. We estimate that there are between 3000 and 5000 Ethernets installed. Corvus has installed perhaps 6000 networks. Datapoint has over

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5000 perhaps. Digital Microsystems has 10,000 alone.

**Quinn:** When the microcomputer was originally introduced by Intel, it didn't reach popularity until software arrived. What could you do with a microcomputer without software? There is a vast change taking place in the networking industry. Where software manufacturers would not support Winchester drives because they did not allow copy protection schemes, and similarly local area networks because of copy protection schemes, they now realize that there are large quantities of LAN (local area networks) hardware, so the software vendors are beginning to change their attitude toward LANs. (Copy protection used to prevent duplicating software also prevents use

> **"***The whole point is to provide the user with a means to access information.***"**
> —Marc Warshaw

of the software on Winchester hard disks or in local area networks.)

**Yara:** From the end-user standpoint, several of the issues you described—sole-vendor dependence, communications between networks, and obsolescence—clearly haven't been addressed on a global basis. There certainly are valid user concerns of inter-operation, of multiple-vendor participation, of the migration path (to future technologies). We are just starting to see activity addressing those issues.

*How are they being addressed?*

**Yara:** They are being addressed by standards bodies (industry groups, such as the Institute of Electrical and Electronic Engineers, that set industry standards) and through product standards. . . . Both areas are reflec-

tions of that end-user demand.

**Miller:** I agree. As a software supplier, we've moved to provide some of that transportability. We are addressing that by at least providing the hooks into the operating system (ability of the basic operating software to allow a personal computer to link into a network); proving compatibility, at least on the data level, between different network types and different hardware, both 8- and 16-bit.

Another area I hope we can address is data integrity, which is going to become more important as more users start sharing information—and getting their information clobbered by each other. Right now, I don't believe most users are educated enough to understand the implications of sharing. . . .

**Warshaw:** I disagree. . . . (Problems with data integrity) are already rearing their ugly heads.

**Morrow:** Why run on a time-shared or network environment then, when you could have the application all to yourself?

**Warshaw:** I'd like to put it a little bit differently. We're in a state of transition with regard to networking. Originally, networking was a means of sharing physical resources without sharing the data—trying to prorate costs. But as information-sharing becomes more important, we have to support both sides of the market.

**Morrow:** This year, you're going to see disk-based systems for $1000. I don't see this business of sharing hardware or multiprocessing as (offering any) cost advantage.

**Warshaw:** I agree. But the point I wanted to make regarding software and sharing is that one of the things that we are finding is, first that you have to support the software that is out there, and an awful lot of this software is not network oriented. People are still buying this software, and want to use it, so we have to deal with it. They want the software to work, and when it comes up they want it to access a file exclusively. On

the other side of the coin, there are developers who want a consistent system under which they can develop their software.

**Bass:** I'm not sure I understood Mr. Morrow's point.

**Morrow:** For people delivering these multiprocessor, multiuser systems, one of the selling points has been that since several users were sharing common processors or common storage, that there was a cost advantage of stand-alone units. That has been true. Now we are in a transition.

**Bass:** What do you think about sharing common data?

**Morrow:** That is the *real benefit* of networking or multiuser systems *not* sharing the hardware. Because the costs of the machines are coming down. There will be a cost disadvan-

> **"***Software vendors are beginning to change their attitudes about LANs.***"**
> —Tom Quinn

tage to buying a multiprocessor machine just to share hardware.

**Ferris:** I disagree here. There are a variety of motivations for local area networks, one of which is sharing hardware, actually. Amortizing, for instance, the cost of printers of different types. You don't want everybody connected to . . .
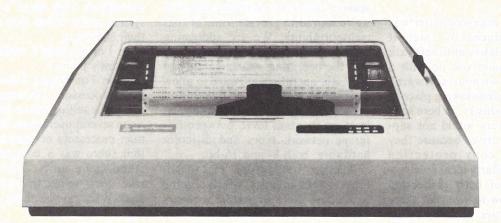
**Morrow:** If you have three people connected to one printer you drive everybody crazy.

**Ferris:** Well, the point I wanted to make is that there are certain kinds of hardware that people *do* want to share—including printers of various shapes and sizes.

**Shoch:** This discussion is rather like a bowl of spaghetti. You sort of pull along a piece of it and have trouble following it. I think we are falling

into the classic trap of every conversation I have had on local area networks, and that is (in assuming) that there is *a thing* that is called a local area network, and that they can be talked about in the aggregate. I happen not to believe that.

Local area networks are tools; they are components and as such they are no different in that sense from a memory board, or a keyboard, or a chip, or anything else. As a component, they are used in many different applications to fulfill many different requirements. Therefore, when one talks about local area networks, it is important to do segmentation to understand what problem you can confront or solve with this tool.

On the other hand, you can use a local area network—such as Ethernet—as the backbone communications link simplifying terminal access to mainframes. . . .that is one application of that tool. . . .There is a very different requirement that you can fill which is the endeavor to build what are sometimes called diskless workstations or shared-disk systems, where the cost of the hard disks (is amortized over several users).

**Morrow:** That is virtually the same as talking to a mainframe.

**Shoch:** I would argue that it is very different in the types of end users, the protocols you have to implement and the communication interface. For example, instead of just having local access to your files, what you are saying is that instead of having shared files, you are moving information through Ethernet, with shared services such as that there is always a pendulum, there is always a point in time where it is more effective to have shared service. I happen to be pessimistic about that in the long run because the cost trends in disks are such that use of a shared server for reading and writing to disks purely for costs savings will not be attractive as the costs fall.
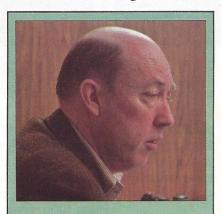
There is a third application, which is to provide sharing of data at a very, very low level. You can do that either

by taking advantage of a mechanism which allows you to read and write remote pages as if they were local pages, or also with a device that serves as a specialized disk server, solely intended to support multiple access to a local hard disk.

A fourth example is more the style of what we do with Ethernet, which is to have individual systems with their own disk for performance reasons, but we have shared servers including high-performance laser printers, and large capacity disks. . . .

*How does that differ from the application you numbered two?*

**Shoch:** A shared hard disk is at a very low level, and that is why I am trying to distinguish that. It is of the flavor: I issue a read command to my disk and instead of reading it on a local



**❝***There is a need for a common standard, at several ends of the marketplace.***❞**
—Charles Morrow

disk it happens to read it from a remote disk. That is one very particular style of application. It is very different from building a very complete, comprehensive data-base server, or a print server that serves multiple users. . . . There are a lot of subtleties involved.

**Morrow:** There is a point that drives

hardware guys like me crazy. You said that ( networks) are kind of like a memory board. They aren't. If each one of us goes our separate way, then it is kind of like a memory board, but the market is not being well served by everybody going their own way. There is a need for a common standard, at several ends of the marketplace. . . . Ethernet is a kind of de facto standard at the high end of the marketplace although it is very expensive. . . .

**Shoch:** I am going to have to rise to the bait, but go ahead.

**Morrow:** There is a similar need for a standard which doesn't necessarily meet the performance of Ethernet, but should cost somewhere around $100 per node for low-end machines. There is no indication this is coming, and this makes (networks) different than a memory board.

**Shoch:** Let me rise to the bait for a moment. The first commercial Ethernet board was the Intel Ethernet pair of boards; we had them embedded in our equipment, but we never sold them (separately). The price of these boards has been falling by about half every year. The cheapest one we sell is $750. And that is generally less expensive than a high speed modem. If you look at our projections you see that the cost of adding Ethernet to a machine will (soon) be in the *$20 to $30 range.*

**Morrow:** Twenty to 30!

**Shoch:** The cost of the chip will drive toward that.

*You said Ethernet is very expensive; what does Ethernet cost?*

**Bass:** We can add Ethernet to a micro for around $600 now.

**Morrow:** When a micro sells for $1200 to $1500 that is expensive . . . Do you think we'll see the cost of the hardware, that is the hardware necessary to hook the micro to the cable, to fall to the $20 or $30 range?

**Warshaw:** It is hard to argue with Mr. Morrow's point that there is room for a low-cost standard. There is a place in the market.

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CIRCLE 147

**Bass:** One of the questions for those of us who endorse Ethernet is whether the corporate user will be satisfied with the evolution (of low-cost networks) as compared with the evolution of Ethernet. They may very well serve a cluster of personal computers, and that may well be the end of it, but for an application that wants to evolve and be more demanding of the technology, those technologies first of all are more limited and over time the (price) differential is going to converge between them and the price of Ethernet. But for someone who wants to enter today and only wants to pay a few hundred dollars, that is representative of what is going on today among the lower-

> **"***User concerns clearly haven't been addressed on a global basis.***"**
>
> —Ron Yara

priced alternatives to Ethernet.

**Yara:** Let me try to give a semiconductor (industry's) view of whether we are serving the end user's cost requirements. In 1984, as far as Ethernet (is concerned) this will be the first big year. As for products that we'll be shipping to OEMs who in turn will be putting them in equipment for end users, this is the big year, clearly. And just by virtue of the marketplace having that many solutions attacking the problem, the price will come down. We are talking about component costs in the 1986 time frame of $25 . . . .

**Metcalfe:** We can talk dollars here (but it is easy to get misled by component costs that must be translated into board prices). You say your board sells for $750, ours sells for $950, yours goes for . . . $850. I'm just trying to get this in perspective.

**Bass:** Talking about these costs is similar to John's concern earlier about comparing different things. These hardware costs are very insignificant compared to the service the user may want. We are talking about embedding the controller in the existing product. These costs are fair if you assume that the rest of the design is going to take on the other networking issues, the other communications issues. If you're talking about installing a communications service either in a building or accessing a piece of equipment that doesn't have communications capability, then we're only talking about the basic hardware costs.

We drifted into the ISO model a while ago (standards for levels of software to enable communications); there are substantial issues above the raw hardware costs to achieve networking. And how those costs are delivered to the user depends on how the solution is delivered to the user. Whether he buys a turnkey solution, or whether he tries to embed it in his own product, or whatever approach is taken. I think the hardware costs are relevant and it shows that they are declining, but many of us would like to hold up the service costs because we are providing something beyond what Intel provides (as a manufacturer of the integrated circuits used in Ethernet hardware) to build a product that is a service to the user. If we have to pass that on at Intel's costs we're out of business.

**Ferris:** I absolutely agree with Charlie. There is a widespread misconception among end users that, "Well, one node will cost me $650, another node will cost me a bit more than that, and etc." Charlie is absolutely right, they often ignore the tremendously high cost of things such as installation, and that may be the cost of installing wire or the cost of having a technician come in—that you haven't anticipated—to work out how to install the thing. People frequently run into real problems with retail dealers,

at installation, then they hit problems with training.

**Shoch:** The retail dealer doesn't know how to install it?

**Ferris:** Many retail dealers have a tough time understanding the product. They mis-sell it. They make the end user's expectation too high. It is not that they are acting in bad faith. But the point here is that there are significant costs involved in training and installing local area networks. People who know about maintaining networks are very expensive. If he is an outside consultant, you'll be doing well if he'll cost you $40 an hour. Frequently you'll have to go to $80, $100 an hour.

**Morrow:** You can easily swamp the

> **"***Many retail dealers have a tough time understanding the product. They mis-sell it.***"**
>
> —David Ferris

hardware costs. . . .(and) there aren't nearly enough consultants to go around.

**Ferris:** That's right. The average end user today has expectations that are far too high. He thinks it (installation and operation of a network) is going to be much easier than it is, and he ends up often being significantly frustrated. . . .when he suddenly finds that dBASE II doesn't work quite right or that WordStar users interfere with each other. Now those are relatively isolatable problems.

But we also think there are problems that end users in large corporations should look out for. They ought to think of broader issues. For example, they will probably find that they want to do 3270 emulation to make their personal computers hook into the mainframe. When you look at local area net vendors that offer

communications capabilities, you find that there are relatively few that have made major investments in those areas. Those kinds of things can make the difference between being able to grow and being able to do what you want a year hence.

**Morrow:** Now wait a minute, the hardware vendor doesn't have to act as the source of that communications capability. Somebody can come in and do it for you.

**Warshaw:** I disagree vehemently. One of the things that Corvus has invested quite a few dollars in is an SNA connection off of our network technology ... The point is we are not going to sell hardware unless we can sell services with it. This echoes what Charlie was saying. One of the things people are saying is 'We like your



**"** *Operating systems in next-generation products will be built with an awareness of networking facilities.* **"**
—Charles Bass

Omninet, it's easy to install.' We provide 3270 emulation, which we feel is a link to the past. But on the other side of the coin we provide the means by which file transfer can take place between a mainframe and a personal computer on our network. Now the whole point is to provide a means for the user to access information. That is what it is all about.

*Let's turn back to what we can do today. Returning to Mr. Shoch's four points, what can we do for the end user today?*

**Shoch:** Let me talk about a couple of examples. We use Ethernet as an important component in the 8000 series of office equipment. The Star workstation, the 860 word processor. What I remind people is that we sell office systems, not Ethernet systems, although Ethernet is a very important component. Our particular application is major accounts, with multiple users in large business establishments. That means, for example, that there is a substantial investment on the part of the customer. We have a full-time, dedicated direct sales organization. We work with the customer to understand his requirements. We have planning and installation resources where we will come in and do physical installation. We supply a comprehensive office system in that market, for direct sale we can provide a level of support that fully solves very substantial office needs.

That is one example. And in crafting a business you have to make sure you cover all these points.

We can now look at a very different point in the customer space, the guy who has a small office or home or classroom and has four or five (units)—he will not find a direct salesman to come call on him. He goes to the retail channel and runs into the problems we've heard about here. We run into the problems of customer support, of less expertise, therefore putting greater importance on good manuals and user guides. Take 3Com's Ethernet; it is an Ethernet but it must be partially installed by the user when he takes it out of the box.

Now those are both perfectly good applications for local area networks, and you have two very different kinds of users. It is interesting to note that the same technology works in both, but the way you market it and support it is different.

**Morrow:** There is a huge difference between the corporate customer and the guy in business who wants an economical, practical solution. He doesn't want to spend any money at all. He wants it like a telephone.

**Shoch:** Let's be careful. I think you find both (types of customers within large companies). I think you find small departmentalized groups within companies that prefer localized decisions that will send the office manager to the retail store to buy the solutions, and you will find the corporate customers.

**Morrow:** The whole thrust of the corporate customer now is to put down those "local insurrections" and get them dead and finished, to bring it back to the MIS manager, and IBM is addressing their whole product
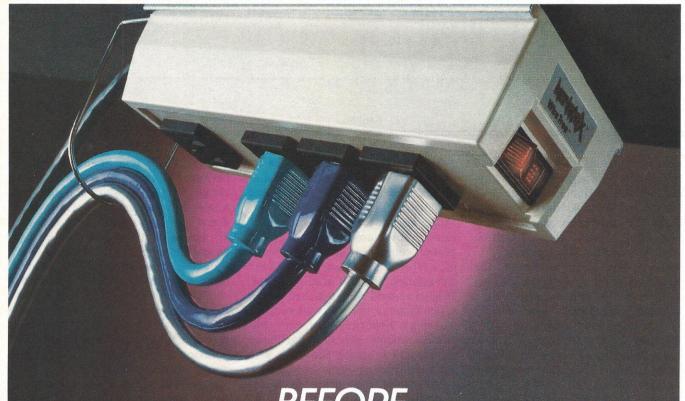


**"** *The average end user today has expectations that are much too high.* **"**
—David Ferris

strategy to exactly this point. The corporate customer and the end user are totally different animals.

**Bass:** I think you're basically right, but I think the one common denominator is that they are both served by standards. The customers' insurance against running into these problems (reliability, etc.) is the issue of standards. There are going to be many

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people participating who can give him what one vendor did not.

**Miller:** We look at three areas that we think the end user is concerned about: One is data portability, both on existing 8-bit machines, which is obviously the world that we (Digital Research, Inc.) own; we have two million units (running CP/M). There is the 16-bit world, which now is PC-DOS . . . We are concerned about maintaining portability about multiple operating systems, not just PC-DOS and C/P-M, but also UNIX, where we have a relationship with Intel. We are concerned about portability of network types.

The second major level is data integrity, not only at the file level but in the RAM itself, and that is an area that can only be addressed by the silicon manufacturers themselves, with chips like the Intel 80286—which we find will be very important.

The third area the user cares about is application transparency, which is an area we have worked hard at providing, so that existing applications, whether they are CP/M or MS-DOS, run on the network. As far as the user is concerned, he just has to identify or map the resources he would like to have that local program appear to be writing to and get it down to that level.

*Let's be specific. What can you provide for the end user in each of those areas today?*

**Miller:** What we can provide today is a real-time operating system that allows a network to run through my personal computer and talk to a mainframe at the same time and also, if the poor little chip can still run, run an application at the same time. We can provide that with Concurrent CP/M-86 because networking is integrated in with the operating system and only at the higher levels. We have the capability of having portability among multiple network types.

**Morrow:** Let me take the end-user's role. If I have an application, say WordStar running on your CP/M,

do I understand you correctly that if it doesn't find a file on disk A or B, that it will go out and look for it on the net?

**Miller:** Ah, now that is where we need the network people.

**Morrow:** (You don't provide that but) you have the hooks (to tie the operating system to the network). . . . what kind?

**Miller:** The most important is remote operating system access, where I can ask from a remote machine for any of the operating system calls. . . . What we are trying to provide is a platform for the end user, to protect his investments once the standards for networks do arrive.

**Morrow:** Does Corvus support this?

**Warshaw:** Yes.

**Morrow:** So, from the end user's point

> **"***Data integrity . . . is going to become more important as users start sharing information.***"**
> —Darrell Miller

of view this is one answer, if Corvus and DRI work together.

**Bass:** One of the reasons (the Xerox systems work) is that Xerox has made the tremendous investments that put the kinds of tools and management capability that they have (in the customers' hands). Without that, they could be chaotic. I think a lot of the personal-computer networks are very thin. Basically, what we (the personal-computing industry) have done is taken network technology and patched it in to an operating system that was built with no awareness of a network. It is single-tasking (running one application at a time), thinks all of its files are at arms length—and we've put a network on it. I think we have done this in a piecemeal fashion. There is utility to that and people are

buying it—and in many cases it is satisfactory. But I believe the next generation of products will be such that the operating system will be built with an awareness and possibly even a requirement for networking facilities and the transparency that John is talking about with the Xerox system. Then it will be possible with personal-computer systems. Icons and connections and all the resources the end user needs will be immediate and transparent based on the combination of the operating system and the communications system.

In general, we are not there yet.

**Metcalfe:** May I contribute a list to try and get at what is available and what will be available soon? I think there is general agreement around the table that software is the issue.

While we've been talking I've put together a list of the five types of the sixth category (of applications software), those being the major software categories: word processing, spreadsheet, graphics, data base, communications and—networking. Networking being the sixth category. And I looked at that category and said, "What are the types of network software?"—and this list will change tomorrow. The first category is 'unnetworked' software, software (that can't be networked) either (because the writer of the software messed up or the network supplier messed up and didn't offer true transparency). Generally, there is very little unnetworkable software around because people are getting better at operating systems and networks. There is a second category, which is where 99.9 percent of the software is today, transparently networkable software that used to use disks and printers and still does but the new trick is that the disks and printers that we now call (are remote from the personal computer). It is very important to serve that which is single-user, stand-alone software.

The next category is what we call network distributed, which is soft-

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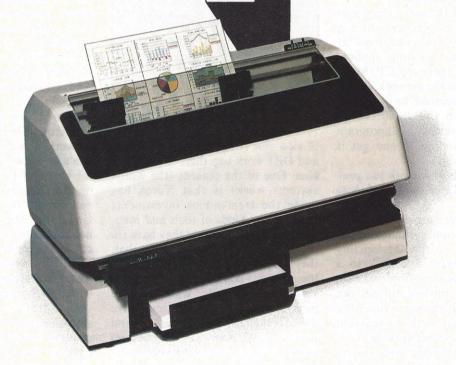
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ware that is still essentially single-user but it is distributed through the network. With network distributed software, a single diskette is loaded into the server, allowing all users to access that program. This is less expensive than buying a separate program for each user on the network. For example, a network copy of Visi-Word can be purchased for $575 and shared by many users, while an individualized single-user copy costs $250. This is not to be confused with multiuser software, because here the users cannot simultaneously manipulate data. With the advent of multiple-user software, that is software that is transportable along the network . . . a multiuser data base is the best example. That is where today is, those are beginning to arrive now, software that does record-locking across the network.

The next category is what I call network integrated. This is a new category. What it means is that network software will no longer be the sixth category of software. Integrated means that it will be subsumed and be part of the other categories.

**Morrow:** Isn't this sort of thing getting more into the responsibilities of the operating system?

**Metcalfe:** Exactly. Networking will be intrinsic to the operating system. Today we are just beginning to see software in the fourth category, multiuser software.

**Warshaw:** What this requires is nearly the same functionality, if not the same functionality as a minicomputer.

**Metcalfe:** I don't disagree. (But, interestingly we have) encountered resistance to that idea (from end users). Those that have participated in the personal-computing revolution will resist what we are doing if it means putting the MIS manager in charge again.

**Warshaw:** They don't want that.

**Metcalfe:** They certainly don't. Well, then we (seem to be saying to them) with all these functions you can have

what you had three years ago . . . .

**Warshaw:** There is a coda I have to put on that which is that the hardware is more flexible, the software is more flexible. It's easier to use. It's friendlier. It's designed for people.

**Bass:** Standards are emerging and standards are good, but the world will always be a kludge. But those of us who help the user through this, build a system to make his business work, and build bridges between technologies; you can say it's a kludge, or the pendulum is swinging, or anarchy which grows over this revolution of microprocessors is settling, or whatever, or the shakeout . . . . a few standards are emerging and we must find a way between them.

*What are emerging as the dominant standards?*



**"***We have to be careful not to fall into the trap of calling LANs one thing.* **"**
—John Shoch

**Bass:** You can discern a few dominant suppliers and a few dominant software themes. The suppliers will be Intel, DEC, and IBM, the products they make and the dominant software that they represent. Look at all the combinations of MTS to MS-DOS, UNIX to MS-DOS. Those problems are probably going to be

solved. Those are important enough payoffs that they are going to figure out a way to move data and intercommunicate between those themes. Solutions are going to emerge. However, if you are off in a proprietary operating system, a proprietary piece of hardware or a proprietary architecture or network, there is a chance that the vendor of that isn't going to solve it and industry isn't going to value it enough to solve it.

**Metcalfe:** There is an image that we are all hunkering down now to PC/MS-DOS. The image that computer history is now all over, that the 8088 has been selected for all time, PC-DOS has been selected for all time . . . .

**Morrow:** All time is the next year and a half.

**Metcalfe:** Exactly. Things are going to change, that's one of the reasons things are a kludge. As things change, some of our users are going to want to be at the very cutting edge while others want to be slightly below there. Are your readers trying to make (long-term decisions)? I spoke to a man the other day who wants to decide for the next 10 years. I told him he was in the wrong building.

**Bass:** People want to make decisions that will last them that year and a half, at least.

*If the technology turns over every two years, how can the user avoid obsolescence?*
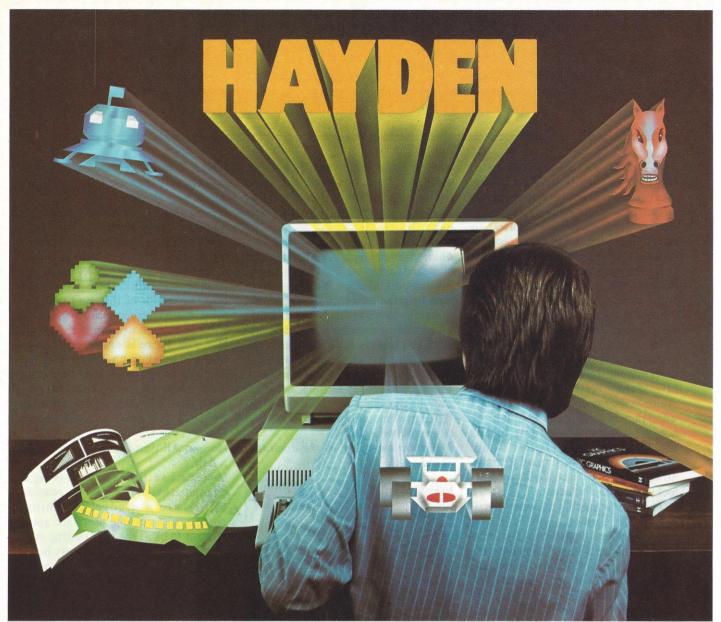
**Metcalfe:** Don't expect to write things off over seven years.

**Morrow:** If you plan wisely you can get out from under in 18 months.

**Yara:** Another point is that the dominant themes will always carry industry with them and that will provide migration paths.

**Miller:** We're providing a migration path from literally millions of CP/M systems to PC-DOS and also UNIX, now. The whole focus of our corporation is portability and transportability.

**Metcalfe:** I think the bottom line is, "Buy now." 🔲

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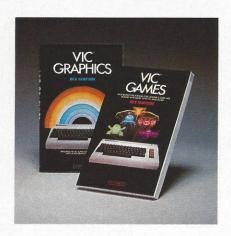
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# The Big Shift In America's Work Ethic

The way we, as a nation, think about work has undergone important changes. In some ways, those changes are a direct result of computing

*by Arielle Emmett, Associate Editor*

In the middle of the night now, it is so easy to work. Not three feet from our dresser is the computer. It is an Apple IIe, recently purchased, and in our cramped apartment we could not find any other place to put it except on top of my desk, where my typewriter used to be.

At 2 a.m. I work, and my husband lies quietly asleep. I am writing an article. My typewriter, as though by magic, has migrated to the kitchen table, and then the dining room table, where it sits waiting for me to use it to dash off a note or a short letter. I still try to use the typewriter whenever I can.

But in the morning, it is the computer again. My husband wakes and, time permitting, he'll play a short game of chess with Sargon II on the computer before showering and dressing for work. He tells me, with delight, "I've beaten the computer," shaking me. "I've beaten it." In daylight now we are driving towards work. In no time, I'm flicking the switch of a Franklin Ace 1000, compatible with the Apple II, swilling my coffee as he goes off to service microprocessor-based laser equipment designed to puncture micronsize holes within the human eye. He is working, as I do, on instruments that had no precedent 35 years ago. I'm 30 years old.

When we return home in the evening, it's so easy for him to con-



*Illustrations by Jon Weiman*

tinue—as I cook, or after he cooks. Fiddling with his circuits in Rocky's Boots now, he grows tired after a while. But then there's always computerized notes for his reports. Or he'll challenge Sargon again to a still higher level of play, until I tap him on the shoulder. Sorry, it's my turn, I have more writing to do.
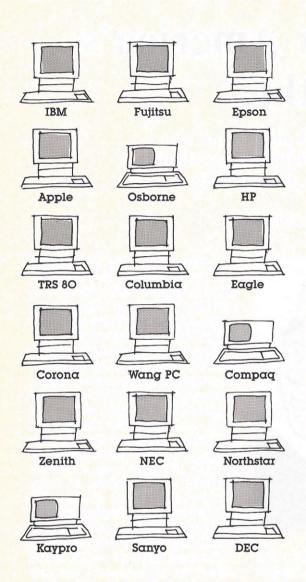
Days and nights meld into one another now. It's winter as I write this, wondering, when does the work end? Where does it end? I'm not complaining, but I am concerned. Here we are, living on a dusky street in a New Jersey neighborhood full of crazy reminders of the past: high ceilings, ancient brick, old cars and TV

antennas, and it's 1984. My husband and I use computers. They were supposed to make life easier. But now we work harder than ever before. It's our choice. The computer has only made that choice much easier for us.

That we should have come to these changes, so far, so fast, is a matter of some mystery to me, however. Only a year ago, we were living in an isolated seaside town, Liscannor, western Ireland, Co. Clare, where the idea of a computer was surely as remote, if not more remote, than the conflicts raging only 300 miles away, across the Northern Ireland border. In Cork, though, not far away at all, Apple Computer Co. was already producing its keypads in a manufacturing facility built there. I didn't know this at the time; we heard no talk of this among the townspeople. I can only remember that my husband and I felt some urge to return to the States, to cities, and to all this craziness; and now we are among the millions who live, breathe, and earn their keep through, or because of, high technology. We! The readers of novels— dreamers—the lovers of James Joyce.

Do you remember now? Staring at a computer screen the first time and finding it weirdly mesmerizing—not necessarily attractive—but mesmerizing, something like the words of Joyce. Sitting once, we read the words; and now staring at the com-

puter, we occupy ourselves for hours pressing the keys and watching the screen take on a life of its own. We controlled that life, suddenly; what you or I did to the keys affected what we saw and felt. It was ridiculous; it was new. For me, at least, a real skeptic, the feelings made as much sense as that Apple television advertisement for the Lisa machine, the one in which the young entrepreneur descends the hill at dawn, unshaven, having worked all night, camera panning to his office computer as he flicks it on once more, scanning the Lisa icons, as the phone rings. "I'll be home for breakfast," he smiles, evidently satisfied with his work. And with his partner who awaits his return. How ridiculous that scene is, as I think about it; if only it weren't true, somehow.

Our cultural history is rife with stories of great geniuses—inventors, musicians, writers—who worked on through the night and came to the brink of creation at dawn. The rest of humanity, according to our stories anyway, has willingly lived by laws of light and dark, activity and rest, sleep and wakefulness, holidays and the honest sweat of the brow. Today, though, who lives by these laws? Who even cares about them, save for deeply religious people? The message of the computer age seems only to be that work is continuous and unrelenting; it is romantic; it is necessary. No one in his or her right mind expects to get ahead anymore playing by the old rules, or the old time frame: 9 to 5. The clock hands have gone askew; or has the clock just become irrelevant? Computers have made us aware of the possibilities of asynchronous life—life separated into acts and qualities rendered in "real time," and those

performed mysteriously within frames so minuscule, or so remote from our other activities, that we can barely think of them as "time" at all.

When we transmit data now, in the middle of the night, as we sleep; when we program a music synthesizer, for instance, to create a myriad of voices instantaneously at the press of a key, and then to change the mix of voices with another key—we are begging the question of what work means. Suddenly a software program comes along—a VisiCalc, a word processor, a data-base manager—that compresses hours, even years of work into a set of electronic instructions preserved forever in a medium, and accessible to all. What are we supposed to do with that? Shouldn't these tools allow us to work less hard, taking away the drudgery of mechanical operations and freeing us up for creative and stimulating labor? Or do they, instead, invite us to work even more—harder, faster, compulsively?

I think of this issue especially when I try to assess my own productivity using a word-processing program instead of a typewriter, as I have for

nearly a year now. I wonder if the electronic medium encourages me to write more because it is so easy to correct my errors, wiping out paragraphs at a whim, juggling sentences around, perhaps prematurely? Or does it simply allow me to hone my work to a point of greater refinement, and still greater frustration? I really don't know. Sometimes I believe it does both. If I were to perform a "head count" of my article and story production since I started using the computer, I could point to an increase in numbers and length of pieces. Are they better than before? Am I simply "in stride"? Do I know more about what I'm writing about, making production easier? Or am I more capable, on the computer, of spewing out garbage and sifting it through until it reaches "acceptable form"? Again, I can't answer these questions.

Like a red cape to a charging bull, the computer invites continuous labor. I do know that. Flashing, maddening, the screen's unearthly light begs us to keep charging even when we are sure it draws blood. What I am trying to say by this is that the computer promises to extend our working life; indeed, it invites us to go for the first, second, third, and fourth rounds. Yet, as we charge, the mind plays tricks. Are we as productive in the eleventh hour as we were in the sixth? Should we expect ourselves to be? What's in the nature of the red cape that compels us so? For one thing, we can begin and end work at any time; if we have a personal computer at home, the working medium actively intrudes on personal space and time. Lines become blurred. A child may run into a room while Daddy is working, sending important memos to his office;

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CIRCLE 196

*A computer may be the agent goading us to expand the expectations we have of ourselves.*

he may either shoo the child away or interrupt himself, picking tasks and booting up a reading or puzzle program to share with her. It all isn't simple. He must act in one way or another as a result of having a computer and a child in one room. By the same token, workers whose lives have been affected each day by computers and other forms of technology have to make equally difficult decisions: How much will they work? How hard will they work? Will they abandon the office as a working space and revert to the electronic cottage? Will they divide their time between two spaces? Or more? Where do they draw the line between work and pleasure? Does it become the same? What yardsticks will any of us use to measure our productivity?

My cousin, an engineering consultant in Clifton, N.J., eschews conventional working style. He's developing a business out of his home, and nearly each day, including weekends, he goes down to his basement office in late morning to work on his small computer. Quite often he emerges very early in the morning, the next day, his wife tells me. She finds him staring for hours at the computer screen, berating himself for not accomplishing more. Yet by accounts of his work, he achieves a great deal, meeting his deadlines through intensive, long hours. Why, then, his frustration?

In some way, a computer may be the agent, a silent partner, goading us to expand the expectations we have of ourselves. It runs with us; its placidity almost demands that we go the longer distance. As we run with it, though, it changes us.

One productivity expert, Carla O'Dell, an organizational psychologist and associate at the American Productivity Center in Houston, tells me her personal computer has made her working life topsy-turvy, overly exciting. Once a late-night thinker, absorbed in quiet, she finds herself checking her electronic mailbox now, even during prime thinking hours, for messages from other scholars and business experts. The temptation—and stimulation—is almost too great.

Another expert, Paul A. Strassmann, vice-president of systems applications at Xerox Corp., Stamford, Conn., concedes: "At 11 o'clock at night I'm talking with people all over the world (via electronic mail.) It's almost become compulsive," he says. Yet Strassmann believes he is working harder, and more effectively and happily than in the past. He points to the redefinition of job roles through personal computers; he does his own word processing, for instance. His secretary has taken on important administrative responsibilities that would have been impossible to handle just a few short years ago. "The personal computer is changing the way we communicate," Strassmann says of nine networks available to Xerox

employees, adding: "A personal computer understands your knowledge base. It understands your gaps in knowledge. The personal computer *is you,*" he contends. "It's a symbiotic relationship."

Whereas I respect Strassmann's opinion, I can't go that far. A personal computer *isn't me.* Whatever symbiotic relationship I have with it makes me nervous. I say this not because I distrust computers, particularly, but because I want to keep them in their place as tools, and not make too much magic of them, as I made of my typewriter when I first received it as a high school graduation gift 14 years ago when I so much wanted to be a writer.

Admittedly, those times seemed simpler than they do now. But they weren't. We had the Vietnam awfulness to talk about; and the environment, and the word "technology" had not quite emerged again as a respectable part of a young person's vocabulary. Our parents were complaining that we were spoiled; that the work ethic was going down the tubes; why, look at Miami and the 1968 siege of the Chicago Democratic National Convention: McCarthy, Kennedy, Daley. Remember? What were those kids doing protesting, fighting? It was as though they were yielding to the forces of entropy. There they were, demolishing those long-cherished values of hard work, frugality, temperance, and the stiff upper lip. What became of them? And what about those values? How fares the long-embattled work ethic today?

You may suspect, inferring logically from the meat of this essay, that the work ethic is faring brilliantly again, thank you. Our nation is back on track economically; we are

*The message of the computer age seems to be that work is continuous and unrelenting.*

more conservative politically; and we have a pack of personal computers, millions of them now, telecommunicating all over the place and churning out better stand-alone work products. All these developments will lead us to ever-greater cycles of productivity, the argument goes: better ideas, better products, better decisions, and more of them, even as the Japanese snap at our heels, or, more appropriately, we snap at theirs.

Not to be a pessimist, now; I think a rosy-fingered dawn is a necessary thing, whether it be promised or actual. But the evidence currently does not support such a picture. In fact, recent work attitude surveys conducted by leading opinion pollsters point to more contradictions in our working lives than we could have ever predicted. Among these is the degree to which technology has made work more interesting without, necessarily, making workers more productive—if, indeed, we can accurately define what productivity is.

One of these surveys, the Public Agenda Foundation report on "The Work Ethic and Economic Vitality," Daniel Yankelovich, chairman, published May, 1983, reports that "close to half of American jobholders (45 percent) say they have experienced significant technological changes on their jobs in the last five years. More than three quarters of this group (76 percent) say that the changes have made their work more interesting, and 54 percent say technological changes have given them greater independence."

Yet the Yankelovich report does not conclude, automatically, that these stimulated, more independent workers are producing—in the majority—more work and work of better quality. Instead, it notes,

"New technology . . . has the effect of making industry much more dependent on the activities of individual jobholders." Discretion in the workplace—the ability of the individual worker to exercise choices about how the work gets done—has increased, in other words. While industry must depend on highly educated, technically proficient workers to carry out its tasks, the workers themselves are reporting a *decline*—that's right—a decline in their own work effort. According to the survey:

" . . . there are signs that the level of effort and motivation have not kept pace with the increase in discretionary effort . . . Rather than increasing their effort to respond to the new competitive realities, there are indications that work behaviors are deteriorating."

The report indicates that only 22 percent of those surveyed on their work habits said they were performing "at full capacity." Forty-four percent reported they did not expend "a great deal of effort . . . over and above what is required." Sixty-two percent reported that they

"believe people do not work as hard as they used to." Among the independent surveys cited in the Public Agenda, one of them, conducted by the University of Michigan Institute for Social Research, indicated that "the gap between actual time worked and 'official' work hours increased by more than 10 percent" between 1965 and 1975. Parallel decreases in the rate of productivity growth were also noted: from a 3 percent growth rate increase between 1955 and 1965 to an average annual rate of 1.9 percent between 1965 and 1975. Finally, the Public Agenda report cited these trends:

- A deteriorating ethic of "male self-sacrifice"
- Erosion of the willingness of jobholders "to surrender their autonomy in the workplace"
- A growing skepticism about the ability of the economy to provide "material payoff that was the reward for hard work and sacrifice of autonomy." "In 1968," according to the report, "58 percent of the public agreed with the statement that 'hard work always pays off.' This figure dropped to 44 percent in 1978, and our research shows that only 36 percent endorse this view today."

Despite these gloomy figures, the work *ethic*, as opposed to work effort, remains surprisingly strong, according to the Public Agenda report. Citing a 1980 Gallup poll of workers, conducted for the U.S. Chamber of Commerce, the Public Agenda indicates that "an overwhelming 88 percent of all working Americans feel that it is important to do their best on the job." Among American workers, the Gallup study "identifies 'a widespread commitment' . . . to improve productivity." But productivity won't improve until some bottlenecks are removed.

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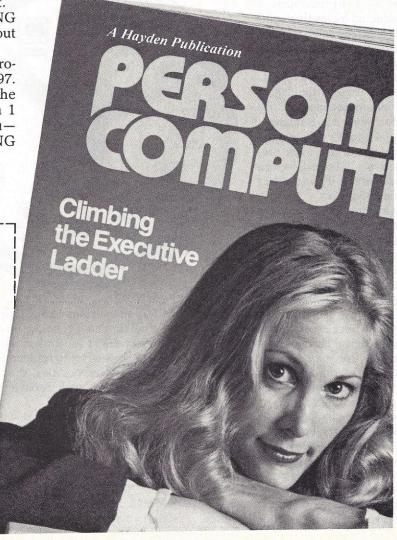
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PERSONAL COMPUTING

Climbing the Executive Ladder

*The only important relationship
that can hold any test of truth for us
is the one between the worker and his work.*

What are these bottlenecks? The report indicates that corporations reinforce "lowest common denominator" standards of quality control and performance. Managers are still caught up in antiquated and authoritarian styles of management that deny the worker a sense of involvement, responsibility, and autonomy. Too often, corporations stress so-called "satisfiers" rather than "motivators" in getting their employees to work harder. Rather than seeking to motivate through genuine incentives—such as tying pay and promotion closely to merit, and recognizing superior work—many companies still focus on attractive perks that do not necessarily increase employees' effectiveness.

The Public Agenda report emphasizes that certain types of incentives may function both to motivate and to satisfy. One such incentive is "interesting work"; technology, as is mentioned in another part of the report, makes work "more interesting" to vast numbers of American workers. And yet the Public Agenda does not directly address the question of how technology may serve as a prime motivator. Can it? Or is technology less important than the involvement of people in what they do? Everywhere in the Public Agenda report, the accent is on people; removing bottlenecks to productivity amounts to "enabling" people, not machines, to do jobs better and more effectively. Among the report's major recommendations is to enforce, within the workplace, high standards of quality in the work, and in expectations; another is to look hard at status and "authoritarian" structures of management within the corporations. These structures may undercut the work ethic and high levels of performance as workers see symbols of status and pay unfairly distributed. The report argues instead for an entrepreneurial style.

Much has been made of this in recent months—a spate of books and articles, fear and trembling and much hand-wringing about our competitive postures domestically and in the second and third worlds. There has been plenty of backslapping also: entrepreneurs selling lots of books, going on TV, selling the new lean and mean, aggressive, quality-controlled America. Does this mean we are all working harder? Or better?

Several years ago, when I was writing a piece on the work ethic for a major metropolitan newspaper, *The Detroit Free Press*, I talked to a U.S. Commerce Department economist, Edward Denison. He told me, "We really have no independent measure of how hard people work." Changes in productivity figures, he said, "do not imply how hard people work."

An N.S. Donnelley professor of the history of Christianity, Jerald C. Brauer, of the University of Chicago, added: "Productivity is no longer related to the cost of physical labor expended because of the efficiency of modern machines."

One UAW official remarked, angrily: "Output per man-hour is really a question of capital investment and technology." He argued that the pollsters and analysts were wrong when they said that declines in productivity could be linked to an erosion of the work ethic. America was simply not investing as it had in the past. Once again, the American worker was getting the rap.

All these observations, I believe, have relevance today. But when I reflect on them, as I do the Public Agenda report, the opinion polls, the finger pointing, the back-stabbing, it is so easy to get caught up in the rhetoric that I don't know anymore what I think. Yet I do know . . . the only important relationship that can hold any test of truth for us, in the final sense, is that relation between the worker and his or her work. The playwright Anton Chekhov alluded to this in *The Three Sisters*: We must work! Work! All of us! No greater sense of purpose can be de-

rived, other than from work and love. If nothing is wrong there; if delight and frustration and exhaustion and exuberance come out of it; if feelings of confidence abound, and can be shared, then work has served at least one of its primary purposes. Anything that blocks that purpose can only be construed as detrimental to the worker and the work.

I suppose now it is time to come back to computers again, but I have one more thing to say before I do. I believe we've gone seriously off-track by failing to respect the value of daylight and darkness. If we are to forget the highways and the machines, and look upward, through smog-bound cities, toward stars, whatever they might mean for us, we have to think there was some purpose in dividing the day between light and dark.

I know that may sound ridiculous, in this electronic age. I should be the last to complain, seeing that my primary work tool has come to be this electronic wizard of night.

But I must say I've gone wrong somewhere. There is meaning to a cycle; there is meaning to the word, and respect for, rest. "Rest." A simple word. We don't make much of it in America. "Work" is a much more respectable term. "Productivity" depends on work, not on rest. But that is wrong. A productive person is a happy person, one who works hard and plays hard; one who knows the meaning of achievement as he or she knows the value of rest. The Greeks said it; I'm not the only one, and certainly I don't mean to foist my opinion on you here. But I must say it again, within the context you and I must surely come back to: Computers are no good unless we know how to ignore them. Shut them off. Ignore them. We are not only charging bulls. We should not always act that way.

I'm looking forward now to a vacation. I'm flying 3000 miles and leaving my personal computer behind. And I don't want to think about it.

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